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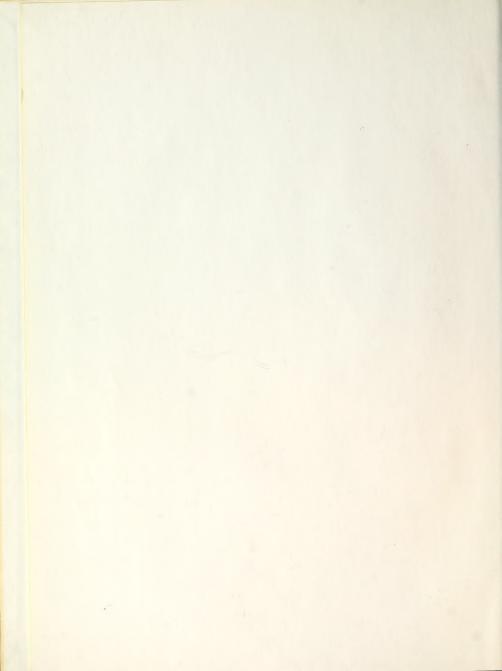
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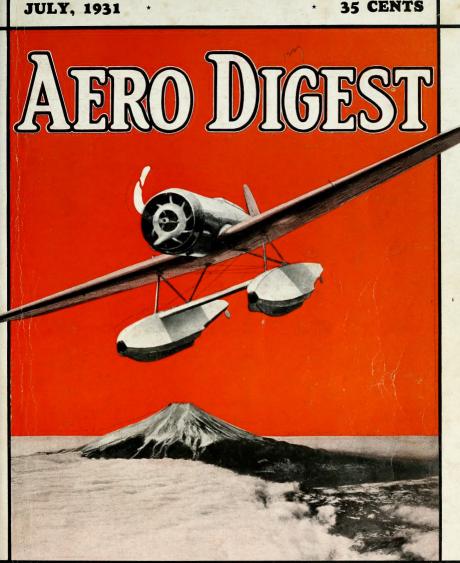
San Francisco, California 2014







35 CENTS



Lindbergh's Lockheed Seaplane Airport Development More Altitude Flights Aerial Survey of Colorado River Basin

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## SIX BILLION HORSEPOWER-HOURS



noto by U. S. Army Air Corps, from Wide World photos

This view of a detachment of Keystone Bombers was snapped at Bear Mountain, above the Hudson River, while the planes were en route for their second visit to New York during the maneuvers

## PRODUCED BY WASP AND HORNET ENGINES DURING THE WORLD'S GREATEST AIR MANEUVERS

The recent air maneuvers brought home even to the most casual observer the remarkable efficiency of the Army Air Corps. Within a period of fifteen days, some 3,500,000 plane-miles were flown—a total of 31,500 hours in the air. Over 1,500 men were transported. This record is particularly remarkable when it is realized that the planes were operating from widely scattered bases and under all sorts of weather conditions.

To us, in the business of building aircraft engines, the power back of this huge demonstration was of absorbing interest. Of the 765 engines

powering the planes, 408, or 53% were of Pratt & Whitney manufacture. In terms of power, Wasp & Hornet engines produced over 198,000 h. p., or about 56% of the total—some 350,500 h. p. During the maneuvers Pratt & Whitney engines delivered, without faltering, more than 6,200,000,000 horsepower-hours.

Another demonstration of faith in Pratt & Whitney engines. And of Pratt & Whitney dependability. The same dependability that leads 90 per cent of the regularly scheduled air transport lines of this country to use Wasp & Hornet engines.

## Wasp & Hornet Engines\_



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EAST HARTFORD . . . CONNECTICUT
Division of United Aircraft & Transport Corp.

Manufactured in Canada by Canadian Pratt & Whitney Aircraft Co., Ltd., Longueuil, Quebec; in Continental Europe by Bavarian Motor Works, Munich; in Japan by Nakajima Aircraft Works, Tokyo.



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The most outstanding value ever offered—a "real" airplane with side by side comfortable draft—free cockpit—with detachable dual controls—low pressure tires and Oleo landing gear-folding wings-speed ring-a superb 80 H. P. engine—built for strength and all aerobatics—perfectly stable in any maneuver top speed well over 100 M.P.H.—a surprising alide—a comfortable landing—with operating costs far below the average automobile and priced at only \$1790 F.A.F. the Manufactory-Nicholas-Beazley Airplane Company, Inc.-Marshall, Mo.

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## THE ARMY AIR CORPS USED

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...IN THE GREATEST AIR MANEUVERS OF HISTORY



Lubricating the Nation's A Fleet with Kendall Oil at Bo ing Field, Washington, D. Kendall Oil was shipped to t Army Air Corps at 35 Air D pots in America, Hawaii, Ph ippines and Canal Zone.

OF outstanding interest to every flyer who holds good lubrication important, is the fact that Kendall Oil was used exclusively by the U. S. Army Air Corps at all army field bases occupied in connection

with the great aerial warfare maneuvers in May 1931.

At every army airport—Fairfield, Wright Field, Mitchel Field, Bolling Field, Langley Field and Middletown Airport—the 672 military planes participating in the maneuvers were supplied only with Kendall lubrication. Nothing that might interfere with complete success was left to chance.

At the various commercial fields visited during the series of flights, where army specifications could not always be followed, marked preference for Kendall, wherever

Kendall Refining Company congratulates the U. S. Army Air Corps, its chief, Major General James A. Fechet, and Brigadier General Benjamin Foulois, in command of the First Air Division, on the brilliant success of the 1931 Air Maneuvers. available, was evidenced by the army pilots. The efficiency of the nation's Air Force was admirably proven in these vast exercises over 100,000 square miles of territory and Kendall is proud to have been

chosen to do its share.

In the even greater "peace time maneuvers" of hundreds of mail, passenger and private planes flying daily throughout the year, Kendall is giving unfailing protection to working motors, living up to its reputation as "the 30-hour oil."

The world's finest crude—Bradford Grade of Pennsylvania—is used exclusively in the expert refining of Kendall Oil. For full details on Kendall Oil and a list of airports where it may be obtained, address: Kendall Refining Company, Bradford, Pennsylvania.



## KENDALL OIL BRADECT PENNS

REFINED FROM 100% BRADFORD GRADE OF PENNSYLVANIA CRUDE July, 1931 3



# Let's think and plan in

### BIGGER FIGURES

AT the end of 1930, the 27th year of the aircraft industry, there were less than seventy-six hundred licensed aircraft in this country. It is estimated that only about fifteen hundred of these were privately owned and operated.

When the automobile was twenty-seven years old, there were over three and three-quarter millions of motor cars, most of them privately owned and operated.

What can the aircraft industry learn from this rapid universal adoption of the automobile?

Early in its existence, the safety and simplicity of operation of the motor car was brought within the reach of the average person of normal physical capacity. The airplane has required special aptitude and long, costly training.

Day-in, day-out, security of motor travel was rapidly demonstrated and quickly accepted. The average private citizen has not regarded the airplane, piloted by himself, as comparably dependable.

The Autogiro offers the aircraft industry its first opportunity to emulate the sales development of the motor car. It can be operated, after comparatively brief instruction, by any person of normal physical capacity, because the Autogiro is immune to most of the airplane's situations which are critical for the private owner.

Because of its removal of the airplane's principal limitations, plus its fast-spreading public recognition and acceptance, the Autogiro promises the manufacturers a growing market ample to justify their thinking and planning in terms of far larger future production and sales than heretofore.

The Autogiro Company of America is not a manufacturing or selling company. It is solely an engineering and licensing organization. It owns and controls, exclusively, all Autogiro patent rights in the United States. Manufacturing companies of high standing will be licensed to build Autogiros with the full cooperation of our engineering staff. We are prepared to arrange demonstrations to acquaint the industry with Autogiro principle, design and operation, and to discuss production privileges.

Present licensees are: Buhl Aircraft Company, Detroit, Mich. . . . Kellett Aircraft Corp., Philadelphia, Pa. . . . . Pitcairn Aircraft, Inc., Willow Grove, Pa.

Characteristics—The Autogito differs basically from all other heavier-than-air craft in the source of its lifting capacity. This lift is given primarily by four rotating blades which take the place of the familiar wings of an airplane. There is no time when this supporting rotation of the blades can be stopped while the machine is in the air, as their motion is produced solely by wind pressure caused by the movement of the Autogiro in any direction, climbing, level flight, gliding or descending vertically. The supporting rotation of the blades is entirely independent of the engine, whose sole function is to propel the Autogiro.

The Autogiro presents flying characteristics hitherto impossible. It can take off at low speed after a very short run, and immediately assume a steep-climbing angle. It can fly well over 100 miles per hour or as slowly as 25 miles per hour. It can be brought momentarily to a standstill and hover. It can bank and turn slowly without fear of loss of forward speed. It can glide or descend vertically at a speed less than that of a man descending in a parachute, and with virtually no forward speed even with a dead engine. Above all, it can not fall off into a spin from a stall. As a result, little operating skill is required.

At right: - Fleet of Autogiros caught by the camera of Cy La Tour





AGAIN RYAN LEADS THE WAY! America's premier combination course of "Training—plus a new Plane" is now offered at prices never before possible. Under this plan you'll train six to eight months in the refreshing seatinged air of Southern California, and then fly home in your own ship with your Transport License ready to begin aviation activities immediately. This RYAN Course effects a saving of more than \$1,800. Note these other outstanding advantages:

THE TRAINING: This is a complete U. S. Government Approved Transport Course under Government Approved Instructors—including, not merely 200 hours of flying, but also night flying, large cabin ship time, primary and advanced aerobatics, formation flying, 3,000 miles of scheduled cross-country flying, and a thoroughly fundamental ground course with 400 hours of lecture and shop practice. In every detail this is the same training as its provided in the standard Ryan Transport Course at \$3,100.

THE PLANE: You'll receive the latest type ship produced by the Great Lakes Aircraft Carperation and exhibited at the April, 1931, Detroit Aircraft Show. This new plane, which lists at \$3,185 F.A.F. San Diego, will arrive in California by carload shipment and will be assembled for you from a bonded warehouse on the day you arrive in San Diego to begin your enrollment. Great Lakes planes are built by one of the largest aircraft contractors to the U. S. Army and Navy, their 90 h.p. air-cooled Cirrus

motors develop a speed of 110 M.P.H.—yet their upkeep cost is no greater than that of a small automobile. This is the sturdy ship and motor with which Tex Rankin recently established a world's record of 78 outside loops.

THE SCHOOL: The T. C. Ryan Flying School is one of the oldest and best known in America. All of its flight training is concentrated under the experienced supervision of T. Claude Ryan, original designer and builder of Ryan monoplanes, founder of Ryan Airlines and President of Ryan Flying School and Ryan Aeronautical Company, You'll enjoy training in San Diego, California—the city which bases the Government's largest aircraft operating squadrons—the city where 42 aerial records have been established —where daily flight activities continue on large scale throughout the entire year.

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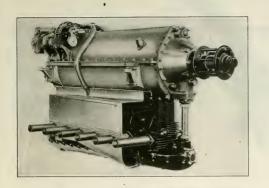
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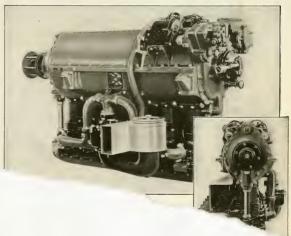
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AIRPLANE ENGINE



Any way you look at it, it's a fine engine!

The many advantages offered to the discriminating user of this ultra-modern aircraft engine are fully described in a folder which will be sent upon request.



\$1465.00 FLYAWAY FIELD

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WHETHER you are from Missouri or at least think that "seein' is believin'," we urge you to take your first ride in the ALEXANDER FLYABOUT. Take your friend and puppy, if you wish . . . there's room for all three of you . . . make yourselves comfortable in the finely upholstered seats, slightly staggered for ample shoulder room . . like sitting in the front seat of your auto.

Give her the gun... you're in the air before you know it... the quick, easy take-off will surprise you... she climbs like a high-powered roadster on a 14% grade... now

bank to the right or left ... no effort ... see the quick response ... really effortless control ... now bring her in ... so easily ... so smoothly ... so slowly ... so safely ... and in a space about as big as your back yard!

Check the actual operation cost of this amazing flivver ship . . . your own eyes won't deceive you . . . above 25 miles to the gallon of gasoline . . . over 100 miles to the pint of oil . . . hard to believe perhaps . . . but actual performance does not lie . . . yes, the price of the FLYABOUT is only \$1465 flyaway field!

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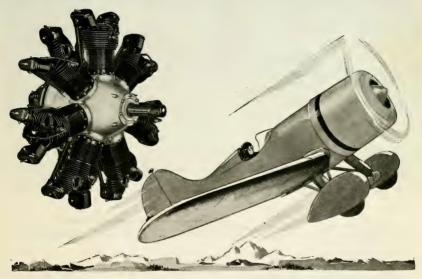
JULY, 1931

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CONTINENTAL AIRCRAFT ENGINE COMPANY

General Office and Factory, Detroit, Michigan





AWAITING THE NIGHT RUN

## Here Is Tomorrow's Air Transport

MUCH has been said about the transport planes of the future. The question has been—what will the plane of tomorrow be like The answer is found in the Burnelli Transport pictured above.

Air passenger traffic in the United States increased over 133% in 1930, with 450,000 people traveling the airlines. Now these passengers demand more speed, more luxury and more comfort.

Also night flying doubles the time saving value of air transportation. Such flying demands maximum safety and comfort. Burnelli Transport design meets these requirements in generous measure—plus increased aerodynamic efficiency.

Just as the covered fuselage evolved to advance present airplane design, so too the all wing trend increases the efficiency and utility of the air transport for the coming expansion of air commerce.

The Burnelli Transport combines the high efficiency of the single engined airplane with the increased safety and capacity of the nacelle type multimotored

plane. Its advantages are: Accessible multiple engine compartment, allowing inspection and repairs during flight. ¶ Extensive reduction of head resistance, necessary to high performance. ¶ Reduced turning moment on one engine, assisting flight with one motor operating. I Fuselage lift reduces landing speed, valuable for slow and safer landings. Increased capacity of fuselage, maximum space for comfort and light cargo. ¶ Practical landing gear retraction, greater future aerodynamic efficiency. ¶ Superior safety in operation, through the location of the engines and propellers forward of the pilots and the passenger cabin. ¶ Structural efficiency and simplicity. Constructed of extruded dural with flat sheet covering. Stresses of engines, propellers and landing gear bear no relation to wing truss. ¶ Convertible to seaplane. The wide fuselage permits efficient twin float attachment, interchangeable with landing gear. 

Designed to meet exact operating requirements.



## THEY GAVE "ME" THE JOB



No. 1

of a series of actual experiences of Von Hoffmann Graduates.

Mr. Richard McDougall
North Robinson, Ohio-writes:

"As you will see, I have a job as instructor at the Bucyrus Aviation School. I am getting along fine. Please tell Mr. Johnson and Mr. Vale that when I showed them I had graduated from Von Hoffmann's, they gave me the job. And I am proud of it!

## There's always a job for a Von Hoffmann graduate.

David Regester, Monongahela, Pa.: "A few weeks after graduation, I started with the Curtiss Wright Flying Service."

T. H. Worthington (address on request): "I placed my application a few days before I completed your Ground Course. I was immediately called to work. Just as soon as I told them I graduated from Von Hoffmann, they took a stronger interest in me."

Located on the famous \$2,000,000 Lambert-St. Louis Municipal Airport

## VON HOFFMANN AIR COLLEGE

440 Lambert-St. Louis Municipal Airport, St. Louis, Mo.

U. S. Department of Commerce approved School for Transport, Limited Commercial, and Private — Ground and Flying

## To the Class of '31

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The sober selection of Aviation as a lifetime vocation is good business. The world is turning from wheels to wings. The real opportunity is just five years ahead. Learn aviation now—where the leaders learned, at the Von Hoffmann Air College where you get the most thorough of any course in the Principles of Flight, the Theory of Flight, Principles of Construction, Materials of Construction, Engine Instruments, Flying Instruments, Maintenance and Repair of Motors, Aero Dynamics, Aerology, Aerostats—all about aviation.

Located on the famous \$2,000,000 Lambert-St. Louis Airport (highest rating of A-1-A), the Von Hoffmann Air College is one of the oldest and most successful in the Country, with the highest possible Government rating as Transport, Limited Commercial, Private Pilot, Ground and Flying.

We turn out serious air-minded men—not mere graduates. Our system calls for your consuming every bit of training, checked by rigorous examination standards. Thoroughness plus unequalled aviation training facilities, is the reason why Von Hoffmann graduates are air leaders today and will be tomorrow.

Von Hoffmann Air College training open only to students 17 years or older. If you are not yet 17, send for information on our Home Study Preparatory Course.

Write for "WHAT AVIATION OFFERS YOU."

## SERVICE and DISTRIBUTION for the Air Corps Maneuvers



In the carefully coordinated plan of the Air Corps, which made its recent air spectacle possible, one of the chief problems was that of arranging fuel and oil supplies. These had to be of highest quality. They had to be available, in varying quantities, from coast to coast, at each of the airports visited. Adequate facilities for rapid servicing of large numbers of planes were needed at each field.

The following approximate figures outline the service record of Stanayo distributors:

Supplied products to 92 fields (95% of fields visited) Supplied three-quarters of a million gallons of Stanavo Aviation Gasoline with Ethyl (87 octane number) (72% of the gasoline used)

Supplied 7,000 gallons of Stanavo Aviation Engine Oil (44% of the oil used)

Made available 650 men and 300 tank trucks for the actual servicing.

When you consider the purchase of oil and gasoline, consider also the proven record of Stanavo, not only in military planes, but also in the operation of leading commercial lines, the world over. You can rely anywhere and everywhere on the quality of the products developed by the organization which believes "the best is none too good for Aviation."



# STANAVO AVIATION ENGINE OIL AND GASOLINE

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STANAVO SPECIFICATION BOARD, Inc.

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## Designed to give the MAXIMUM in service at the MINIMUM in cost

A LTHOUGH selling in the low-priced field, the Rearwin "Junior" is a normal powered airplane of sterling value. The "Junior" was engineered throughout by the builders of the famous Ken-Royce, winner of over 100 performance tests. Like the Ken-Royce, it will give its owner all that he expects of an airplane at a price that will make him want to fly it at every opportunity.

Although the "Junior" has only half the power of an OX engine it compares very favorably with—and in some cases exceeds—the performance of the average OX biplane which costs a great deal more to purchase and operate. This because the "Junior" weighs only about one-third as much. Such performance is yours at the rate of only a cent a mile.

When we say that the Rearwin "Junior" offers the buyer more for his money we do so with very definite reasons in mind. For instance—the "Junior" has a gasoline capacity of fourteen gallons, whereas most other light planes have only five to eight. The landing gear, which has a spread of six feet, is wider than most by two feet, thus assuring safer, smoother landings and take-offs. The undercarriage is also built unusually rugged to stand the gaff of hard student landings. Shock absorbers, in addition to semi-airwheels make a combination which cannot be equalled for smooth handling on the ground and long life of the plane.

Probably the most outstanding advantages are the cutaway wing center section for greater visibility, the unusually large cockpit and roomy door and the heavy tail skid. This last point is exceedingly important. The majority of small airplanes due to insufficient weight on the tail skid require considerable skill to land in a high wind. The Rearwin "Junior" however, is built with more than 100 pounds on the skid, thereby eliminating the hazard of high wind landings.

We have a profitable tie-up which we would like to explain to a few wide-awake, responsible dealers. Your inquiry by letter, wire or phone will receive prompt attention.

CONSTRUCTION AND EQUIPMENT:

Wing spars of spruce. Center section leading edge of formed spruce covered with birch plywood. Trailing edge of formed sheet duralumin. Wing tips of covered steel tubing. Wing fittings cadmium plated. Welded chrome molybednum and carbon steel tubing. Length 21 feet 8 inches. Span 26 feet. Height 7 feet 6 inches. Cutaway center section, dual controls, full-size two-place tandem cockpit, semi-airwheels, shock absorbers, perfect streamline, rich finish, customary instruments, 72-inch landing gear. Space for luggage, stabilizer adjustable from both seats.

With 45 h.p. engine - \$1795 With 37 h.p. engine - \$1595

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FAIRFAX AIRPORT

KANSAS CITY

KANSAS

JULY, 1931

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By Major V. W. Pagé, Air Corps, U. S. R.

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HE most complete treatise on all types of alreraft motors ever published. A gold mine of necessary information for flying schools, pilets, field mechanics, abop These two velocuted of the property of the pr

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TMUS second revised and enlarged edition of Yancuy's monumental work will be welcomed by aircraft pilots, students and veryone interested in the important bullet of many properties of the properties of the transport pilot and those preparing for transport pilot examinations. The author, Capt. Lewis A. Yancey, famous translatantic figure, is a practical naviator with more than 15 years' experience, advisor to important long distance flights, cuturer, teacher.

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#### MODERN DIESEL ENGINE PRACTICE

Theory-Practical Applications-Operation-Upkeep and Repair

By ORVILLE ADAMS, Consulting Diesel Engineer

THIS book was written with the purpose of combining in one solume, a text for index and reference—and a practical manual on operation and repair. Every fundamental basic fact requisits for understanding Diesel Engine theory and book, arranged in a local order, and written in easily understand inappuage for the practical man. Information arews before available is included in this new book of the property of the

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THE Lincoln AP (All Purpose) cabin monoplane is the undefeated champion of its type. It is a great plane for sportsmen pilots, traveling salesmen or anyone wanting a real combination of beauty, stability and general performance. Price \$3995.00.

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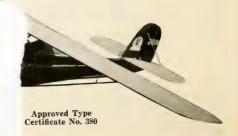


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American Eagle-Lincoln Aircraft Corporation
Kansas City, Kansas



JULY, 1931



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800 feet up...cut the gun...get ready to set 'er down. Just as Socony Aviation Gasoline has powered your plane in flight, so you'll find no excess flooding at the carburetor when you cut the gun.

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NEW SOCONY MOTOR OIL SOCONY

STANDARD OIL COMPANY OF NEW YORK



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	"85"	"70"
Power-LeBlond	85 H.P.	70 H.P.
High Speed	100	93
Landing Speed	38	38
Cruising Speed	85	80
Climb at Sea Level	700	600
Cruising Range	5 hrs.	6 hrs.
Fuel Capacity	29	29
Oil Capacity	2 gal.	2 gal.
Weight Empty	1016	1025
Useful Load	574	565
Gross Weight	1590	1590
Wing Loading	8.2 lbs.	8.2 lbs.
Power Loading	18.7 lbs.	22.7 lbs

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\$5,488 earnings in three months with one ship. Over \$13,000 in one season with two

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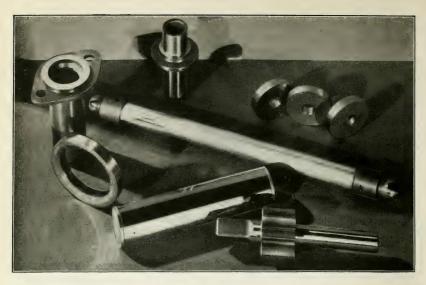
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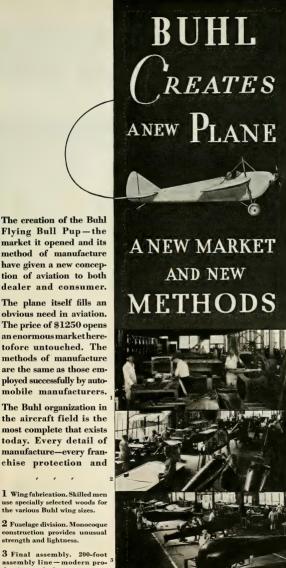
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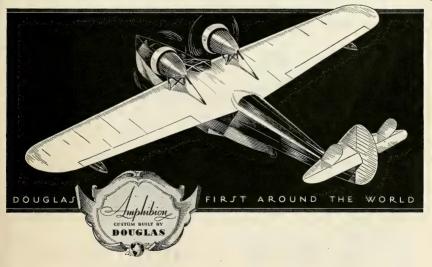
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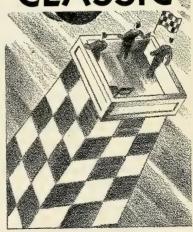
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(Fairchild Aerial Surveys view of Mt. Fuii, Japan: Acme airplane photo)

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Lindbergh's Lockheed "Sirius" twin-float seaplane in a test flight in preparation for its long trip to Japan.

## WINGS OF THE ARMY

#### By Don Rose

EN's memories are short and careless. It must be so, or else they would not repeat the same mistake so often. But since we remember so badly and are such determined optimists we learn very little from experience. A friend admitted it while we talked one day of the war that began about seventeen years ago and lasted too long. "My approximate intelligence tells me," he said, "that I had one hell of a time while defending democracy with a sapper's spade and a pair of barbed wire pliers. I was dirty and pediculous. I went wet and hungry. I was lonesome and homesick most of the time and scared green the rest of it. I was wounded, and I didn't care for that, either.

"But though I know these things, I don't remember them. What I really remember of the war was that it was swell to sit on a French farmyard wall and talk to a girl who could only understand what was absolutely necessary. It was grand to go to Paris on two days' leave and take three. It was exciting to stir around in the tangle of trench traffic, trying not to sneeze lest the German army should fall on top of me. It was elegant to come home a

hero and take a real bath.

"And so I suppose I shall some day tell my grandson, if any, a lot of lies about the filthy war and what I did to make a success of it. And if I should accidentally tell him the truth, he wouldn't believe me anyway.'

That, my dear clients, is more or less the mood of this whole silly civilization. It knows the truth about war, but it can't remember anything except romances. And it may turn out a sucker for another one, if one should hap-

pen in our time.

I mention the matter because an immense amount of nonsense was stirred up by the grand parade of the Army air fleet, as it thundered through the Eastern skies a month ago. It must have made the real soldiers sick. The conversation of the average crowd that watched the maneuvers was appalling evidence that hardly anybody knew what it was all about. The newspapers showed not much more intelligence. And the radio reporters-most of them should have been choked horribly to death with their own adjectives, superlatives and military misinformation.

Very few of the citizens who paid for the show seem to have watched it with imagination or understanding. The only explanation is that they have forgotten already the realities of the Great War and can only think in motion picture terms about the next one. Some of them are going to be downright sore, I suppose, if they live to discover that the next war doesn't film well and probably won't be passed by the Pennsylvania Board of Censors. They look forward, indeed, as carelessly and inaccurately as they

look backward.

What was the big parade about? Since the show is over, we can dispense with the suggestion that it was supposed to display a typical defense by air against a typical enemy coming in from the open sea. This hypothesis was supposed to motivate the plot in the best movie manner. though the movie makers would have managed somehow to add a spice of sex appeal to the performance. The aerial observers in the tall buildings, of course, swallowed it hook, line and sinker, and passed it along at the top of their voice by authority of the Federal Radio Commission. The Army men of old experience must have smiled sadly in their whiskers and let it go at that.

I need scarcely remark to this intelligent audience that an air raid is a swift and secret thing and employs prac-

tically no press agents. I might recall that the British Air Force planned and practiced six months for the raid on Zeebrugge and eight for the bombing raid on Berlin which never came off. The intention was to devise something totally unexpected and then do it neatly, effectively and suddenly. The enemy, meanwhile, had also imagined something totally unexpected and was expecting it. That is the way of war. And the result is that the best laid plans are torn to pieces in the first burst of fire, after which the wit and skill and courage and discipline of soldiers and sailors do the best they can.

But the gentleman with the excited tonsils who sat on top of City Hall tower in Philadelphia and told bedtime stories as the parade passed by, had his war under control at all time. The enemy arrived on schedule and was driven off the same way, without mussing up a single squadron of the defense. And good citizens breathed easier, and admitted that war was terrible but probably great fun.

It might have spoiled the day for the audience if it had realized that this massing and maneuvering of the air patrols was actually not much more than an exercise in elementary tactics, in the moving of troops, and in the executive activities of commanding officers. The same sort of thing is done regularly and elaborately by the ships of the Navy and the varied units of the Army. The difference is that an air show is bound to have an audience. The Navy goes somewhere to sea for its maneuvers; the Army hides in the hills and shoos spectators away with bayonets. But when the Air Fleet flies it can't be made a private matter. Under the circumstances, it was simpler to invite the citizens than to pass a constitutional amendment compelling them to stay in the cellar until the Army aviation authorities had found out what they wanted to know.

They found out, among other matters, that National Guard pilots can keep formation and obey orders. They found out that young pilots are nearly as good as their elders, though you can't commonly prove it by their pay and promotion chances. They found out that an air fleet flies with one foot on the ground and that military strategy in the air needs all kinds of coordination with conveniences and accessories down below. And they found out that military aviation depends much on its commercial cousing

for its efficiency and effectiveness.

These are the conclusions of deliberate tests and not the by-products of a demonstration. It is bad medicine. It believe, to speak of the great parade as a "demonstration." It may have been in the back of somebody's mind that this was not a bad time to show the war-minded neighbors that a peaceful nation is not necessarily a stupid one. There was real strength in the skies on those echoing afternoons when the fleet went by, and it added a little dignity to

(Continued on page 118)

## MORE ALTITUDE FLIGHTS

#### H. B. Henrickson

Aeronautic Instrument Section National Bureau of Standards

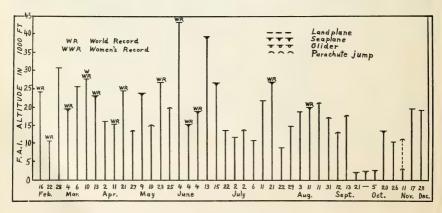
(Continued from the June Issue)

N IUNE 4th, last year when Lieutenant Apollo Soucek, U.S.N., made his most recent attempt for a landplane altitude record, he climbed into his seat, carefully adjusted the oxygen tube, helmet and goggles, and then fastened a "rubber lung" (a slightly modified hot water bottle) to the control stick of the plane. This so-called "lung" was a recent development, essentially a device for supplying oxygen into the lungs at pressures slightly above the surrounding atmosphere. Aside from this new feature, the flying equipment used was practically the same as that on his two successful flights of May and June, 1929. A bimetal minimum-temperature-recording thermometer was mounted in the cockpit in order to ascertain the lowest temperature to which the pilot would be exposed at the greatest altitude. The bimetal-strip, watch-type recording strut thermometer previously described was secured to an outer strut and in the shade of an upper wing. Each of the barographs contained a bimetal temperature element in order to record their temperature. The latter data are of considerable value in the flight-history testing of the barographs.

After the recording instruments had been started and when everything had been adjusted satisfactorily, the pilot took off, leaving the ground after a short run. The little biplane climbed steadily, circling higher and higher into a clear sky until it was lost to the view of even the most careful observer. After about an hour and a quarter, a drifting wreath of "white smoke" appeared in the sky almost directly overhead. This fleecy wreath was only the frozen

moisture which drifted away from the exhausts of the motor. The phenomenon continued for about fifteen minutes and then suddenly disappeared. The plane itself, of course, at this extreme altitude, was invisible from the ground. A flight of two hours and seven minutes was made with a landing almost at the very point of take-off. It was surprising to find upon disconnecting the oxygen exhaust tube that it contained several large chunks of ice which had accumulated from the moisture of the pilot's exhaled hreath.

A glance at the bimetal thermometer inside of the cockpit showed that the temperature there had been no lower than -34° Centigrade (-29° Fahrenheit). An examination of the recording strut thermometer revealed the fact that the clockwork had run during the entire flight, producing a spiral trace on a camphor-smoked disk. Near the end of the climb, however, the trace became very broad, due to a decided vibration of the pointer. The center line of this broadened trace, nevertheless, was later found to indicate a minimum temperature of -67°C±2°C (-89°F). The lowest temperature of the barographs during the flight was -32°C±3°C (-25°F). As a result of flight-history tests on the official barograph, the lowest pressure reached was found to be 118.1 millimeters of mercury. As required by the F. A. I. rules, the official value becomes 118 millimeters of mercury, which is equivalent to an altitude of 13,157 meters, or to 43,166 feet. This is a world's record for all classes of aircraft, exceeding by 1,372 feet the former mark established by Willi Neuenhofen on May 26,



1929, and by 696 feet that made unofficially by the late Captain H. C. Gray in a balloon.

Another record flight was made on June 4 by Pilots Wilhelm Zimmerman and Schinzinger of Germany in a Junkers Junior 50.W seaplane, equipped with an Armstrong-Siddeley Genet motor of eighty-five horsepower. The take-off was made from Dessau. Their flight was successful in establishing a new mark for a light seaplane of the first category-that is, a two-seater weighing less than 600 kilograms (1,322 pounds). They attained a minimum pressure of 421 millimeters of mercury, which is equivalent to 4,614 meters, or to 15,138 feet.

Again on the same day, Wilhelm Zimmerman took off alone in the same ship, climbing until the greatest altitude attainable was reached. The seaplane once more was successful in establishing a record, this time for a plane in the fourth category, that is, a single-seater weighing less than 250 kilograms (551 pounds). The minimum pressure recorded by the barograph was 365 millimeters of mercury, which is equivalent to 5,652 meters, or to 18,543 feet.

Late in the afternoon of June 13 as the weather suddenly cleared to a cloudless sky, Lieutenant Apollo Soucek took off from the Potomac River in the Wright Apache now equipped with pontoons. As on the former flight, the ship was equipped with a Wasp and a Root's supercharger. Two dual traverse barographs were suspended within the fuselage, and the free-air temperature recorder was fastened to an outer strut.

An altimeter, graduated in F. A. I. altitude, was mounted upon the instrument panel so the pilot could note at a glance whether or not he had exceeded the former record for a seaplane. The ship took off easily and climbed normally without mishap for about seventy-five minutes, after which time the pilot noted an oil film forming over his goggles. At first he believed it to be frost, but on noting the falling reading of the oil pressure gauge, he realized that it must be oil and that there was then no alternative except to stop the motor and glide back to earth. The mishap occurred, unfortunately, at an altitude of 38,000 feet while the ship was still in a climb. It was found later that a drain plug had unscrewed from the base of the supercharger and that the oil had leaked out. After gliding from a height of approximately seven miles, the ship was landed safely off Hain's Point, not far from the Naval Air Station. The total flight time was one hour and forty-five minutes.

An inspection of the strut thermometer revealed that the lowest free-air temperature was -61°C±2°C (-78°F). Official tests on the barograph, made on the following day, showed that the lowest temperature of these instruments had been -27°C±3°C (-16°F). Tests made at the latter temperature indicated a minimum pressure of 143 millimeters of mercury, which is equivalent to 11,930 meters, or to 39,140 feet-higher than the existing record but under F. A. I. rules failing by seventy-six feet to establish an official world's record.

On July 11, the late Miss Ruth B. Alexander took off from San Diego, California, in a Barling NB-3 light monoplane powered with a Warner Scarab engine of ninety horsepower. A long steady climb was continued until her oxygen supply ended. The pilot recalled nothing more until she found her ship in a gentle glide at an elevation of 18,000 feet. On realizing that further climb was useless, she started down and landed the plane safely at Lindbergh



Ruth Nichols, holder of women's altitude record, 28,743 feet

Field. An excellent barograph trace showed a two-hour climb to maximum altitude, and a decent which required about thirty minutes. The minimum pressure recorded was 320 millimeters of mercury, which is equivalent to 6,583 meters, or to 21,598 feet. Five months before, D. S. Zimmerley had established a world's record of 24,074 feet with a similar ship and powerplant. In Zimmerley's case, however, the motor was sixteen pounds lighter, which enabled his ship to qualify as a light plane.

On July 21, Captain Boris Sergievsky made an altitude flight from Bridgeport, Connecticut, in the Sikorsky S-38 seaplane, with a payload of 1,000 kilograms. The ship was powered with two supercharged Pratt and Whitney Hornet engines, each of 575 horsepower. The air temperature at the sea-level take off was nearly +100°F, but after climbing steadily for almost an hour it dropped to -4°F. Oxygen was used only at elevations above 18,000 feet. On the descent, the thoroughly chilled plane while passing through some clouds became coated with ice, which melted off as an approach was made to sea-level. The plane landed after a flight of one hour and seventeen minutes. The sealed barograph, after a flight-history test, showed a minimum pressure of 252.5 millimeters of mercury, which is equivalent to 8,208 meters, or to 26,929 feet. This was a world's record for a seaplane carrying a payload of 1,000 kilograms.

On August 3, Pilot A. A. Garofolo made a flight from the airport at Westfield, New Jersey, in a landplane powered with a ninety-horsepower Lambert motor. The tested barograph showed that a minimum pressure of 350 millimeters of mercury had been reached, which is equivalent

to 5,952 meters, or to 19,527 feet.

On August 11, Captain Boris Sergievsky again took off from Bridgeport, Connecticut, in the Sikorsky S-38 seaplane—on this occasion loaded with a 2,000 kilogram payload. It was powered as before with two supercharged Hornets. Again the trial was successful in establishing a world's record. The barograph, after official tests, showed a minimum pressure of 344 millimeters of mercury, which is equivalent to 6,074 meters, or to 19,928 feet.

Another altitude performance of August 11th was that made by James Donohue at Colorado Springs, Colorado, a

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## AIR—HOT AND OTHERWISE

Facts versus Pessimism

Frank A. Tichenor

EPRESSION last year marked the daily, weekly, monthly records of every business and industry in the United States and it will make dents on this year's. But

it has been, is, and, until it vanishes, will be international, not merely national, and we shall get off comparatively easy. So let's quit groaning. The general hard times have not been exclusively the result of any Government's procedure, but of the methods which during a long period of the recent past characterized the various major procedures of humanity in general.

To everything fact fixes a limit—to unwarranted debt, to unjustified credit, to amusement (which is luxury), even to work (which is necessity). Fact determines normality. When any of the thousands of imaginable diagrams wherewith human activities and reactions may be charted show lines shooting far above the point thus determined, excess is indicated and excess is always dangerous, even though it be of something which in reason would be good. Lines on such charts sinking far below that point show an opposite which, surely if it be concerned with anything worth while, is dangerous.

Depressions are discouraging to all but sturdy souls. Booms breed depressions. The mariner wants a wind which will help him toward his destination, not a hurricane which, even though whizzing in the right direction, either may sink him or make him hustle to escape destruction.

Diagrams charting the world's various activities have indicated for almost everything else a worse trend during the bleak past months than has been indicated for aircraft manufacture and associated interests. In other words our industry has suffered less than others. Why? Because it supplies a real utility none other can supply and one which, once it has possessed it, the world never will do without till comes a genius able to crystallize the Aladdin dream of: "I wish I were in Bagdad; presto! I am there."

The aircraft industry has made its error of judgment, management and ignorance, but in spite of them we have gone and are going ahead. The solid fact is that NOTHING can stop the aircraft industry, although many things might stop a would-be participant therein who chanced to be incompetent through that over-enthusiasm which sometimes means under-intelligence.

We shall need Government help, but not of the sort which means a subsidy, only that sort which means legitimate orders from the Army, Navy and Post Office. In return for such help the aircraft industry will give value many times as great as anything it will receive. We have found our place in spite of our mistakes. Our economic value to the country is so great we cannot be eliminated or even neglected.

We shall meet with many obstacles, but they will consist principally of engineering problems not yet fully solved but upon which a constantly increasing brain force is being concentrated here and elsewhere. Such difficulties it is our well established habit to eat alive, then lick our chops and grin.

Many never will be paid in money for the effort they

have made during the past five years; but that is as it should be. To a considerable extent the best effort of human intelligence and enthusiasm has always been its own reward. This has

been no truer in our young industry than in many older industries. But really we like such a condition even while we grumble over it. That's the sort of stuff we're made of. Aviation is the art of flight; its associated industry manufactures contrivances with which to fly; optimism is soul-flight. So of course we're optimists. Optimism is in our line. Nothing can levitate a pessimist and his pessimism. Heavier-than-air is our chief specialty, not heavier-than-lead. Aviation is the most completely illustrative expression of optimism that humanity so far has produced. It is a tremendous flight of fancy become flight of fact. Add practical optimism to the mental qualities which have done what has been done, that study which never has been lacking, that work which never has been lagging, and that economy which is an essential even of the most aspiring human effort, and hard times can't stop us. Upon the contrary we can be, shall be and, brethren, at this present instant, we are being, one of the great influences which will stop hard times.

You have been reading in the newspapers about the troubles of almost every business known to modern civilization. Now read about what optimism, study, work, economy and the fact that we supply a real human demand have been doing for us during those recent periods which have been rendered doleful by the groans of other industries.

The airplane has become so fully recognized as a safe and worthy vehicle that the number of licensed aircraft in America has trebled in a five year period, along toward the tail of which came that depression which has cut so many other industries into three pieces and thrown two of them away. Equipment of fields and routes with lights, beacons, teletype service, radio communication and markers during the very two years of depression have expanded our airway mileage to 15,238, with 3,221 more miles under construc-The 17 radio communication stations of five years ago have become 45; the 12 ill-equipped airway Weather Bureau stations have become 143 highly developed; the 612 revolving and flashing beacons have become 1,652; the 92 intermediate fields have become 347; the 2,041 miles of lighted airways have become 15,000. January 1, 1927, active licensed airplanes numbered 1,908, and now number 7.354.

F. Trubee Davison explains that the splendid Army aerial maneuvers were easily first in the world's operation of large air units. Half-a-million miles were covered in two weeks by the superb aerial fleet without a penny of additional cost to the taxpayer and without any serious accident. The endeavor supplied answers to many military questions which could not find replies save through such practical operations. From the training and technical standpoints, Mr. Davison holds these maneuvers to have been the most productive in history. Thirty-one-thousand-five-hundred flying hours without a casualty indicates magnificent train-

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## AIR SURVEY FOR HOOVER DAM

HE United States has declared war on a mighty river. For uncounted centuries the Colorado of the West, gathering strength from mountain, forest and desert areas now parts of seven States, has carried its waters to the sea in its own untamed and fickle way. First tumbling from the snowy heights of the Rockies, here rushing madly downward, there meandering slowly, it has coursed mountain valleys, traversed desert highlands, threaded grand canvons of its own carving, mile-deep, in the country rock, finally emerging in alluvial valley and delta waste-its own creation and plaything. Here it deposits its millions of tons of sand and silt, building up a trough to the point of instability, then spilling and cutting another as a new local channel to the California Gulf. Twice its vagaries led it into the Imperial Valley of subsea level; constantly has it been a menace threatening the very existence of that highly productive community.

A declaration of war is an act of Congress, in this case the Boulder Canyon Project Act, more familiarly known as the Swing Act, named for the Congressional representative of the

menaced district, whose tireless advocacy of the legislation

finally triumphed over strong opposition. Under this act Secretary Wilbur of the Interior has charge of the struggle. His force is the Bureau of Re-

THE Colorado River project is one of the greatest sugineering undertakings of modern times. Its first stage is the Roover Dam. Where the river now rashes through the lowest of its great causons, this for flood prevention, irrigation, power, domestic water supply and slit detention.

In beginning the project, survey were adjacent area. This area is mountainous, the topography intricate, the summer heat intense—120 decrees in the shade and no shade, ground was not inviting from any standpoint. The airplane was called in, hundreds of air photographs quickly taken, mosaic maps made. The story of this difficult survey is told in this article.

#### $\mathbf{B}\mathbf{v}$ J. B. Beadle

Formerly Director's Assistant, U. S. Reclama-tion Service and Office Engineer, Brock & Weymouth, Inc.



Surveyors and engineers in conference

clamation under Dr. Elwood Mead. its staff of engineers and those who will serve as contractors or workers of various kinds.

The engineers have chosen the point of attack, midway in the sector of the river that is boundary between Arizona and Nevada, just below its nearest point to the Nevada town of Las Vegas. Here the river is entrenched in its canyon, cut a thousand feet in lava rock. At the base of the sheer walls the stream is a scant three hundred feet wide, but through this narrow defile, called Black Canyon, it pours as much as 175,000 cubic feet of water in a second-over 300,000 tons per minute.

The campaign is planned in detail. It is proposed to capture this mighty force with a system of coffer-dams, tunnels and control works, to plug the canyon itself with a barrage of three and a half million cubic yards of concrete-a structure that breaks every dam record in height, volume, water depth, pressure and storage capacity.

It will take six or seven years to win through and cost a hundred million dollars, but the stakes completely dwarf the cost. Irrigation water for

two million acres of hot-house fertility. Domestic water for millions of population in Southern California. Protection from floods for the irrigated valleys and property worth many hundreds of millions. Electric energy for three or



Mosaic map showing one hundred square miles in the Hoover Dam site region. (Photo courtesy of Brock & Weymouth, Inc.)

more States, the power of a million horses, most of it constant—tireless horses ready to work twenty-four hours a day, three hundred and sixty-five days a year, or four and a third billion kilowatt-hours at two cents a dozen, f.o.b. Hoover Dam. A very attractive incidental since it will pay for the works, interest and all.

Plans for such a battle can't be too good. They have been painstakingly prepared and cover every detail from the creation of a brand-new town for housing the workers to the last yard of concrete and pound of steel for the structures.

Accurate surveys and maps are fundamental in such plan-

ming. Best choice of routes over which to transport men and materials to the isolated dam-site, location and arrangement of the many auxiliary constructions in restricted space, knowledge of the successive water lines that will encroach as the reservoir level rises—these are a few of the considerations that call for maps showing the topographic features with a high degree of exactness.

This great engineering project is a symbol of the modern times and it is fitting that in some of the preliminary mapping for it the most modern survey tools have been used, including the airplane and aerial camera. Chief Engineer Walter of the Bureau of Reclamation called for bids last summer on required surveys. A fraction of a square mile at the dam-site was to be mapped on the surface by photo-theodolite. A hundred and twenty-five square miles were photographed from the air; mosaic maps of this were made



Colorado River Basin map by U. S. Geological Survey and Bureau of Reclamation



U. S. Bureau of Reclamation

Down-stream face of Hoover Dam and power plant

up from the air photographs and contour maps of about twenty square miles were evolved from them.

The contractor for the air survey was Brock & Weymouth, Inc. This Philadelphia outfit began air surveys in the early teens when commercial aviation almost ceased to exist with each crack-up and the U. S. Air Service was mostly hopes and havwire. The company developed an automatic air camera, which was tried out at Fort Sill, went into Mexico with Pershing and was contracted in hundreds to the Allies when the United States entered the World War. After the War they developed plate-

magazine cameras for air survey and other precision instruments for evolving engineering maps from the pictures, including projectors to correct for the inevitable slight swing of the air camera out of its ideal relation to the vertical, and measuring stereoscopes that made it possible to see the ground in relief, measure its elevations and run out the contour lines that tell the whole story of ground slopes and heights.

The contract for this work on the Colorado was dated last July. An air party of three men flew from the East to Las Vegas. While waiting for plates and other paraphernalia to catch up with them by train, they were busy establishing base at Las Vegas airport, in making arrangements for their dark-room work and reconnaissance flights over the contract area to study the terrain and plan their system of photo flights to cover the areas to be represented in mosaics and maps.

The first thing they discovered was that they were working one of the hottest spots in the country. This is the section to which the bad Indian, accustomed in life to its temperature, sent back from the lower regions for his blankets. The nearest Weather Bureau station admitted a mercury of 115 or so, but this proved mild compared to the temperature nearer the dam-site. Just what this reached no one knows, but it certainly topped 140 degrees because three survey thermometers graduated to that figure were broken in turn by the heat of July and August.

If this ground was like a stove, the air above it was like a stove-pipe. The rising sun turned on the draft; by late morning the air was boiling up thousands of feet and the survey ship was dancing all over the lot. This threatened to make a lively pendulum of the suspended camera and play hob with level flying, introducing excessive effects of camera tilt and scale-change in the set of photographic plates. Thus the reconnaissance led to the conclusion that all photographic fly-

ing should be done as early in the day as possible. It usually began at 8 a.m. and quit for the day after two or three hours.

Another decision acted on was to photograph separately for mosaic and map purposes. For the latter, using a 7-inch lens, the scale and accuracy requirements dictated a flying level about 6,000 feet whereas the former permitted flights at 10,000, where the air was somewhat smoother. In this way the repetition of part of the area was more than offset by more effective work in smoother air, greater freedom in time of flying and greater area gained per photo shot at the greater height. For each level a systematic flight scheme was

followed to cover required ground area by straight flights or photographic strips, with a lap about 30 per cent between parallel strips and more than 50 per cent between pictures in a strip, as customary in this work. The scale of maps and mosaics was to be 400 feet to the inch, a size rather large for air survey, and quickly running up the number of

exposures

The fliers' log shows that they were away from home base near Philadelphia a month and a day, and were in the air eighty-two hours. More than half of the time was taken up in cross-country to and from the job, and about a third of it was required by the photographer in actually operating the camera, exposing almost a thousand plates. These were all photographs of the kind used for mosaics or mapping, being taken with the camera as nearly in the vertical as possible. At odd times they shot prominent features in the more familiar form of obliques. Otherwise

they had nothing to do except to service the ship, develop their thousand negatives, four dozen to a magazine and several magazines to a flight; to number each negative by hand, make several paper prints from each, several thousand prints in all and at times several hundred a day; to put one set of prints together shinglefashion in rough mosaic as the work proceeded, to verify from this their progress in covering the contract area, the quality of their negatives, the overlaps between plates and strips, in general the technical sufficiency of the photography for the work to follow in making finished mosaics and maps; in short to check each day's results and plan the morrow's work. Every once in a while they got to bed before midnight and found time for three meals a day, so that they became quite familiar with all the best hotels in Las Vegas.

One set of the prints was for the field engineer and his crew, who reached the job almost as soon as the air crew, and measured the ground controls that always go with an accurate air survey. That

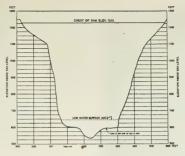


Chart illustrating the profile of Hoover Dam site, looking downstream

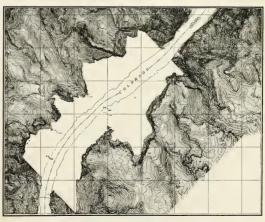
ground crew looked up at the ship in envy, wishing they were in the flying end of the game. For if the ship was in the stove-pipe, they were on the griddle. And mighty busy, too. At first, like the fliers, they based at Las Vegas, and, strange to say, picked out the same hotel. From there they drove to work before daylight. Later they camped in the open.

Their work included in abbreviated quantities several standard tasks of the ground surveyor. A main line of levels was run and double-run to make certain of its accuracy. From this as a base they spread a net of more rapid work, making use of the plane-table and measuring vertical angles for elevation deter-

minations by trigonometry, always closing their circuits back on the main line or on other lines so connected.

They ran a few traverse lines with transit and tape. They climbed some of the steep slopes to peaks or tops, set up signals and carefully sighted from one to another with the theodolite, measuring the angles between such lines as elements in a set of large triangles covering the area to be mapped.

The fliers had finished work by the end of July; the ground crew perspired on through August. But they had one respite from the heat when they taped an exact line on which to base computations and fix values for all other lines in their triangulation. This they did at night, when their measurements required smaller and more uniform correction for temperature. For the survey thermometer actually failed by one or two degrees to reach 100 at any time during this night work. However, survey notes fail



Intricate topography is located from air photographs



Brock & Weymouth, Inc.
View looking upstream at the head of Black Canyon

to record difficulty with numb fingers in holding the tape. The survey data, like the photographic negatives, were hurried to Philadelphia on the instalment plan, first shipment of each by air. There, in the contractor's plant, independent of weather and daylight, field products were put through technical processes to yield finished mosaics and map drawings.

This inside work was the bulk of the job, as it is in any air survey that produces real maps. Work of the technician in subjecting the ground control data to rigorous checks, computations and adjustments, correcting for the expansion of steel tape due to each recorded temperature, for the effect of the measured pull applied to it in the field and the effect of opposite nature due to its sag between points of support, is perhaps less spectacular than flying but the attendant operations offer real fascination.

The map construction began with the control lines and points, plotted with utmost care as a sort of rigid backbone or frame-work on which all the map detail from the pictures could be assembled with assurance that it would be correct in position and fit. As lines of latitude and longitude were to be indicated, the map-maker first drew a grid of these, or a "projection" allowing for earth curvature. To this were added the points fixed in position by the field traverse and triangulation. The latter had a counterpart in the office work with the pictures, from which a paper

triangulation supplemented the major control from the field work and supplied many times the number of control points. This graphic triangulation is one of the most satisfying operations in air surveys with glass plate photographs. By nature largely self-checking, its accuracy is unfailing and superior to some kinds of ground surveys, in which it has often detected errors.

The control plot served as base for both maps and mosaics. For the latter it was transferred to large "boards" of a material that resists shrinkage or warping. Then prints of the photographs were affixed, with an effort to meet three conditions. Picture points should coincide with corresponding control points. There should be general coincidence of common images in overlapping prints. Finally the prints should be so like in tone, lustre and other qualities that to the eye the composite would seem like one continuous picture.

These conditions sound simple enough. Actually none of the three can be perfectly satisfied and the difficulties approached maximum at Black Canyon. Much of the surrounding area is on edge, with canyon, cliffs, peaks and generally steep slopes causing high lights and deep shadows, especially in early morning when the photographs were taken. The sunlit surfaces varied from brilliant sand to dull, weathered igneous rock. Much of it the geologist calls tuff and the ground crew agreed that this name sounded right after a day of climbing the slopes in a heat that would literally fry an egg on any sunny rock.

The mosaic-maker needed all the ingenuity he could command to reach the best compromises-to choose the best enlargement ratio for each print, to allow for its stretching and shrinking in development, to time and shade his printing for the contrasts of Nature in color and reflection, to find trimming lines in the overlap between prints that would give continuity of image and quality. To the mosaic-maker the severe changes in ground elevation cause trouble not only in light effects, but even more in the resulting change of scale in the photographs. A photograph on flat glass through a fine lens is a record of precision to marvel at, but it follows the law of perspectives and not the law of maps. In evolving an accurate map from the photographs the perspective effect must be got rid of; in making a mosaic of the pictures themselves it cannot be obviated, but it can be more or less dodged, compromised or localized by suitable overlap, printing and trimming. How well this was accomplished in spite of the extreme elevation differences affecting the photographs of Hoover dam-site and vicinity can be appreciated only by examining one of the large wall copies of the mosaic, eight by twenty feet overall, hanging in the offices of the Reclamation Bureau at Washington, Denver and Las Vegas, or one of the six copies in atlas form at the same points. Each atlas comprised some forty clothmounted sheets, size twenty-one by thirty-six inches net; each wall copy was made up of five eight by four foot panels backed with wood frames and dowelled together. For making the original from which both were produced, a set of 171 negatives was chosen; frequently two and three prints were made from one plate to improve the match in position and tone.

While the base plot was proceeding, the negatives taken for real mapping were also going through their special processes, which involve essentially three steps. In these the nature of a photograph as a perspective is capitalized. In fact, this character, so troublesome in mosaicing, is what

makes it possible to overcome the effects of camera swing or tilt and to run out the elevation contour lines in the office from the photographs in lieu of chasing them out on the ground, so tedious a job in the case of terrain like that about Hoover dam-site.

The first of these three steps is the correction for tilt. Briefly it is accomplished by a highly refined measurement of the perspective effect, or rather the differential effects between two overlapping photographs due to the difference in view-point from which they were taken. Thus in this operation the plates are treated in pairs, mounted in special instruments that facilitate the measurements, allow a counteracting tilt and serve as precise copying cameras to produce new plates free of the effects. There were about minety of these pairs of plates so handled in this survey. Due to the rugged character of the ground near Black Canyon the differential measurements between overlapping plates at times exceeded an inch, which is an extreme amount in view of the fact that these instruments measure it in units of a thousandth of an inch.

The "horizontalized" plates are next mounted on the measuring stereoscopes, again in pairs. To the operators of these instruments the two perspectives of a pair of overlapping plates fuse into a single view in which the relief stands out vividly like a plastic model of the ground surface, its every rise and fall. Peaks, ridges, cliffs, and other striking features all appear as if carved in miniature, drained by miniature streams and lighted by miniature sun. This miniature is carved to scale, but the scale is enlarged in the vertical. Our ordinary binocular vision gives us a sense of distance or depth, but the effect is greatly enhanced when two overlapping air pictures are seen as if the eyes were at the two points at which the photographs were taken, thousands of feet apart. The perspective base, or the distance between the two eyes, about two and a half inches, would be ineffective at flying height, but in aerial photography there is the enlarged effect due to the distance of a half-mile or more between the points in the line of flight where the air camera successively worked its high-speed shutter. It is a fascinating experience to bring the area of survey, part by part, within view in this way, to sight its different features, measure their heights or depths and trace out the contour lines. This was particularly true of the air survey on the Colorado River, with its stereoscopic views down the sheer rock walls of Black Canyon and over the intricate and wide variety of topographic effects of the volcanic rock formation and its subsequent erosion.

At this stage of the mapping the output of the stereoscopes-unit areas carrying contour lines and other map detail-are still in form perspectives. The third step, relatively simple, is their conversion to map projection, for which a third special instrument is used. This is somewhat like a projector or enlarging camera, but like the others must be a precision instrument. It has variable but automatic focus so that each contour and adjacent detail can in turn be enlarged or reduced and traced at uniform scale. Brought together over the base of control points, these units form the map assembly for reproduction in any conventional way. The topography developed from air survey in the vicinity of Hoover dam-site was delivered in the form of finished drawings in colors on nine metalmounted sheets, size 21 by 36 inches, including borders. Due to the extreme density of the contour lines, representing elevations at intervals of five feet in the vertical, the



Brock & Weymouth, In Retouched photo showing how dam will appear when finished

inking of these sheets was a most painstaking and time consuming task, adding more to the total time of the job than air and ground work together. The Bureau of Reclamation promptly reproduced the finished sheets by lithography, in which form they recently became available for use by engineers, contractors and others interested.

Thus what would have been a most difficult, tedious, expensive job of mapping on the ground, was more effectively, more accurately, more economically accomplished by proper use of the airplane. In general the airplane has given a new point of view for mapping and one much more logical for viewing a part of the earth's surface than on the surface itself. The grounded surveyor, denied a broad unified view of his object, can only build up his record by tediously amassing details, points and lines, hampered by every rise of ground or other obstacle. Looking at the earth that way is something like trying to read a newspaper at noselength or to vision a large building from its door-step. Ground methods are still essential for fixing the control points and lines which give a frame-work for the accurate map, but the photographs excel for adding the bulk of the record-the outlines of woods, cultivation and water surface; the meanderings of streams, roads and rails; in short the cultural and physical detail to be represented and particularly the elevation lines so essential to maps for engineering use.

## CAMPAIGNERS ALOFT

by baldwell

Illustrated with sketches by William Heaslip

**Y**OU six disgruntled readers will be grieved to learn that I have again lost my standing as an aviation executive. I am proceeding from Columbus, Ohio, to New York, and not by train. The sorry truth is that I'm aboard a Fokker F 32 acting as a feeble camp follower of these Army Air Corps maneuvers. I'm in here with an assorted collection of newspaper reporters, photographers, Congressmen, artists, and telegraph company representatives. The social tone of the gathering is admittedly low, but I've been in this air business so long that I'm used to

However far down the scale of animal life though we be, none of us-except the Congressmen-is unemployed. The Commodore, the Captain, and the crew of this giant airliner are at work; the reporters are industriously tapping off their next story; our two famous artists, Bill Heaslip and Clayton Knight, are sketching scenery; and the photographers are growling among themselves. Whenever anyone prowls the aisle long enough to become annoying we simply throw him to the photographers and go on with our labors. It is rather like working in a zoo.

You know. I really went on this trip to keep an eve on these two Congressmen. Commodore Eddie Rickenbacker, in command of this flying formation of engines. steel tubing, and plywood, has had some previous experience with Congressmen; he recently took a party of them up in this four-engined airplane, and when he came down one of the engines was missing. That just goes to show. Well, just so we'd get there with everything we started with, I've been keeping one eye on Congressman Thomas C. Cochrane of Pennsylvania and the other on Congressman Edward W. Goss of Connecticut. I've been doing

that for five days now, and I'm practically worn out. But they haven't got away with anything, despite the fact that they're both Republicans. I'm a Democratic minority of one. The rest of our bunch are either neutral or Communistic, on account of knowing so many adherents of both major parties that they've lost faith in everybody but Stalin and Ghandi.

AERO DIGEST

Well, folks, as we slide along over the beautiful state of Ohio, I'll try to give you an idea of what has been going on these last few days. I'll about manage that by the time we hit New York, and then I'll conclude my account of the maneuvers amid the quiet of my country estate, Fallen Arches, at Malaria-by-the-Sea, Long Island.

But first, a word about the cultured and talented gentlemen who are transporting us over Ohio. They've flown us from New York to Dayton, to Chicago, back to Dayton. to Columbus, and now here we are headed for New York. Commodore Eddie Rickenbacker is in charge. I don't know what his official title is, but on this trip he's working as a sort of steward or hostess. That's it-he's a hostess. He has to herd this bunch of newshawks and camera clickers and other hangers-on around the ragged edge of the maneuvers. That's some job. But as a lad he used to keep rabbits, so he's doing better than you might suspect

It just shows where a leading Ace of the war can get to by hard work and persistence. He worries as much over this bunch of prima donnas as Hoover does over that crew of his in Washington. He prowls up and down the aisle continually, apparently to see that none of us fall out.

While Eddie prowls the aisle, there are two old gentlemen up front flying the formation and looking out ahead. They are about the only ones aboard who can see anything.

> I've stared one of the numerous Pratt and Whitney Hornets in the eye until it is actually shivering with nervousness. If I can keep my gimlet eye on it long enough I may get a hole bored in it and be able to look at more of Ohio. It's a case of "Engines to right of them-engines to left of them. Into the air with nothing visible rode the reporters." Still, we're all writing, so it doesn't matter much. I'll bet most of us are writing lies, because there can't be as much truth in the world as we fellows are grinding out. For instance, Sherman Altick of the New York Sun, has just typed, "The swelling hills of Pennsylvania, rising to the east, tree-clothed, majestic-" and we're still

in Ohio, and it's nearly The Fokker F-32 flat. The old faker! and autographs of The two old seamen on some of its pas-

air maneuvers

the bridge of this great craft are Pilots Victor





Following shadows

.





Bertrandis and William De Wald. They've carried us smoothly and safely all the journey, and now are piloting us toward Pennsylvania. They're the kind of pilots who are turning aviation from an uncertain adventure into a safe and certain transportation business that will appeal to the millions who can afford to fly and who will do so when they can be assured of safety.

Now folks, as we old air tramps go dead-heading through the atmosphere, I'm going to try to pass along to you through the awkward medium of a portable typewriter on my knee some idea of what I have seen and what it means. It will be at best only a vague idea, for to comprehend these maneuvers fully you have to do two things: You have to see them, and then you have to think about them. I'm groping in my poor old mind for words with which to clothe my thoughts—words that will enable you to look inside my head as the ancient wooden wheels creak around.

First, you know that wars are fought with two weapons—money and men, named in the order of their importance. Before the machine age it was men and money, but now it's money and men. A nation has so many men, so many dollars, so much credit; what can be accomplished depends solely upon what use can be made of these factors.

Now, let us consider for a suppositional war game that the United States entered the conflict with twenty million dollars to expend upon mechanical equipment. That twenty millions was spent upon airplanes—pursuit, attack, observation, bombardment, transport, and so forth. In fact, the 672 airplanes and their engines used to make up this First Provisional Air Division cost less than twenty millions. Let us suppose further that this sum was all that the country had to expend for equipment; when it was spent, there would be no more, and the war would be over.

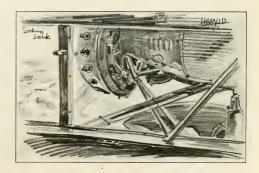
Arrayed against the United States is the great country of Bolonia, also with twenty millions of dollars to expend upon war equipment. The statesmen of Bolonia—most of whom still wear suspenders and red flannel underwear—have never studied anything but the Life of Queen Victoria, in four volumes. Therefore they decided to put their twenty millions in battleships. They found, however, that twenty millions would purchase only half a battleship; but rather than set aside their pet ideas they bought half a battleship—the front half—and put in a rear bulkhead and moved the propellers up behind it.

Now, you get the picture—two great countries with only twenty millions apiece for equipment. The

Looking aft from the cabin of the big Fokker F-32 flying eastward United States has 672 airplanes, and Bolonia has half a battleship. Both have spent the same amount of money for war equipment. If each had spent twice as much, Bolonia would have had a whole battleship, complete with bulges, and the United States would have had 1,342 airplanes. However, as half a battleship will probably be about as effective in the next war as a whole battleship, we'll stage our suppositional war with the half battleship, and just transport the maneuvers I saw at Dayton out to a spot on the Atlantic Ocean, about a hundred miles from New York.

You six expectant readers and I are war correspondents aboard the Bolonian battleship,  $Admiral\ Dedhead$ , steaming along to attack New York. We are making about 23 knots an hour. Suddenly out of the haze to the west come three little scouting pursuit ships, flying about 150 miles an hour, throttled down. The  $Admiral\ Dedhead$  is proceeding under forced draft, but is making only about one-seventh the speed of the airplanes. Behind the three scouts come a squadron of eighteen more, then another squadron, then another. In a moment the sky is full of airplanes. Squadron after squadron rushes over our heads. Then come the huge bombing planes, each with a ton of explosives, which they thoughtfully drop upon us.

The Admiral Dedhead is putting up a great fight. Its air equipment of three planes have been catapulted to repulse the attacks of the 672 American planes, and already have been shot down. The anti-aircraft batteries, upon which the Dedhead chiefly relies for protection against air attack, have been pumping shells aloft, with great éclat. Several of the American planes have been shot down. But out of 672 they are not even missed. The aerial bom-





The "Admiral Dedhead" in action at the height of her fighting career

bardment continues unabated, scoring more frequent hits. By this time you six war correspondents and myself have seized life preservers, have dropped over the side, and are swimming away from the war, jotting down notes as we swim. We are not running away, understand—we are merely getting into a position where we can see better, for by this time the Admiral Dedhead is completely obscured by the smoke of battle and descending columns of water tossed aloft by the bombs.

In ten minutes the First Provisional Air Division has flown over the Admiral Dedhead, which is still on the same spot, only a mile farther down. It has landed, and the war is over.

I have written this in such simple language that I am hoping, perhaps vainly, that even the Congress and Senate of the United States of America may be able to grasp the lesson that I learned long ago and that was emphasized at Dayton, as it will be emphasized again and again before these maneuvers are completed. Wars, I repeat, are fought with money, credit, and men. You can do only so much with so much. None of these factors may be stretched. With twenty millions you can buy 672 airplanes or half a battleship. Multiply your expenditures by a hundred, by a thousand, and the comparative war value of the equipment remains unchanged.

However, this is not an argument against the Navy. With our distant possessions we need a sea-going Navy, amply protected by an air-going Navy. I'm simply point-



The battleship "Admiral Dedhead" two minutes later

ing out that the time has come—in fact, it's been here for years—to study the defense of this nation from the point of view of dollars expended and defense value received. Airplanes, guns, bombs, battleships, aircraft carriers, are merely tools of war—tools that change in usefulness with the changing years. Money and men are the real munitions, the only elements of war that don't change. And men are conservative, slow to change old ideas.

I search my head for words, and I find that I cannot give you a picture of the striking power of this great air armada. Numbers of airplanes, tons of explosives, streams of bullets, are only words and numbers. Stand on a field or on the roof of a city skyscraper as the fleet passes over you, and you will feel and understand what I cannot explain. Here is something so new, so powerful, so elusive, so deadly in destructive potentiality, that the mind of the average man cannot grasp it. Even those who know something about it do not comprehend all it must mean in the next war. Perhaps soldiers who have experienced the agonizing uncertainty of a sustained night bombardment can grasp some of it. Multiply the aerial destruction of the last war by a hundred, by a thousand, and you begin to visualize the next war. And add countless tons of poison gas for good measure.

The trouble with making anyone see the force of air power is the fact that an air demonstration is a beautiful show. It is not particularly impressive, except as a show. The machines look fragile, delicate; they wheel and maneuver like flocks of birds; the sun glistens on their shining surfaces. That anything so graceful, so airy, so light as an airplane could deal death and destruction seems hardly credible to the average spectator. Besides, these were our airplanes, putting on a nice show for us.

I stood on the roof of the Stevens Hotel in Chicago as the division flew past, and I listened to the remarks of the crowd. Not one person remarked on the war power of airplanes. War was not considered. Here were a flock of airplanes going by, and they looked very beautiful. That's about all there was to it. The planes looked very pretty up there—and the pilots must be very clever to fly them so skillfully and not run into each other at such close quarters! The thought occurred to me that I was listening to people who were stone blind.

We got off to a bad publicity start with these air maneuvers. When the Air Corps announced that they were going to demonstrate what they could do if they had to move a whole air force around the country, a small group of pacifists began filling the papers with protests. Of course, they have every right to protest and advance their opinions, which might be more favorably received if the protesters themselves were noted for peace and quiet. But it was noticeable that the clergymen who raised the loudest clamor against warlike demonstrations were themselves members of religious sects more remarkable for squabbling with each other than for getting along in peace and amity.

You know, it is becoming apparent that we will make war so efficient, so devastating, so horrible and unendurable that no nation can afford to wage it. I feel assured that eventually not only war but also the commercial competition that leads to war must be removed from the plan of civilization—or civilization as we know it must perish. We peoples of the world must coöperate, live and let live, or we'll end up in a mutual rubbing-out party. All we'll have left on the earth may be (Continued on page 122)

## EDITORIALS

#### OUR AIRWAYS LEAD

OLONEL CLARENCE M. YOUNG'S report to President Hoover that our Federal airways system is superior to any in the world must be gratifying to the industry, for the industry through intelligence, hard work and financial devotion, often in the face of terrible discouragements, has built it up.

Commercial aviation progressed steadily during the year, in spite of the unfavorable general situation. Forty-four companies employ 650 airplanes upon 125 routes, foreign and domestic. These alone, represent an investment of \$14,000,000 as against last year's 550 planes in service with

a value of \$10,000,000.

Lighted airways increased during the year from 13,400 miles to 15,300 miles. Intermediate fields grew in number from 315 to 370. An additional 1,113 miles are being

prepared for day flying.

The aggregate distance flown is 40,080,000 miles. Passengers carried numbered 418,000. Mail flown weighed 9,100,000 pounds, and more than a third as much express was carried through the air. The nation at present has 1,819 airports, a gain for the year of 164, and 697 new ones are proposed. A transcontinental trunk line is in operation from New York to San Francisco, a second from New York to Los Angeles, and a third from Atlanta to Los Angeles. On the first two, airway construction is complete; on the latter it is well under way.

But here is the best news of all, as announced by Colonel Young. It is that "factories and flying schools apparently escaped the general business depression of the period.

licensed planes and fliers increasing."

#### MISLEADING THE PUBLIC

N our desk is a copy of the letter from the Thompson Aeronautical Corporation, operating Transamerican Airlines, sent to the president of a fireproofing company which, working through a national advertising agency, has strewn the nation with an advertising circular adorned by a lurid picture of a plane which has come down in flames while the pilot is descending safely in a parachute. The subject matter of the circular starts with the statement that "every pilot knows a lesson that business needs to learn," and goes on to describe in sensational short sentences how, constantly in fear of fire, he ever is prepared, even in a sense expectant, to float down in his 'chute while his plane, his cargo, and (presumably) his passengers, meet fiery destruction. It then explains that fireproof safes will protect "priceless records" from destruction.

Mark E. Nevils, of the Transamerican Airlines, very properly "goes after" this untruthful, reckless anti-aviation publicity-unjustified, inexcusable and surely valueless. He aptly terms it "a model of bad taste," to be classed with stories of the undertaker who haunts the sick man's house, waiting for new business. He indignantly and truthfully denies that fire, as is implied, is involved in every airplane accident. Of the 314 accidents of 1928, 1929 and 1930 only five followed fires in the air.

A fair sample of reckless irresponsibility of one business concern, and a big advertising agency, willing to libel another line of industry in order to gain the very doubtful advantage of attracting the attention of advertisement readers who, the writer of the circular must certainly assume, are singularly uninformed and unintelligent. That sort of advertising is resented by everyone interested in this and other industries.

#### AIR POWER OUT OF SALVAGE

THE United States might build itself magnificent air power out of salvage from unnecessary presentday expenditures named for our national defense but really of no value to it.

There are, for one of many examples, the "political forts"-Army posts so placed about the country as to please the constituents of favored Senators and Congressmen. who could profit from the business of selling land for them, building structures on them, furnishing supplies for the men and animals allotted to them. Some of the forts still functioning and costing vast sums of Government money have come down to us from Revolutionary days and are about as useful for modern strategic purposes as the Revolutionary flintlocks would be in a modern war. As public parks, as baits for tourists, above all as markets for local tradesmen and farmers, these political forts (not all of the Revolutionary period-some War of 1812, some Civil War, some relics of Indian fighting days) have been preserved at an immense annual expense. Even the pacifists have let them utterly alone, knowing that they had no significance with regard to war.

The President's strong stand against this serious waste is definitely to be commended. Now let the money saved be used in giving us real national protection-air defense. The money wasted during generations upon these political forts, diverted into proper channels, might do wonders for

the nation's air defense.

#### NO MISHAPS

AN-AMERICAN'S report of no accidents for three months shows that it can be done. Proper skill, proper radio equipment and proper maintenance turned the trick. Skill, care and modern equipment (constantly improving) did similarly for the railways after years. Aviation moves faster. It will not wait so long and tragically.

If the Pan-American can reduce accidents every other airline can reduce accidents. In time all will, of course,

But why wait?

Other lines need not learn slowly by their own experience all the details of what they must do; the Pan-American's

will teach them much if they really care to know.

Public confidence is an essential to the profitable development of America's air transportation. Only a very high safety average will earn or justify it. If all the other lines had gained as much of it as Pan-American has earned and is getting, air transport business generally in the United States would triple monthly for a time. Of course it can be done and of course it's going to be done.

## MONEY-MAKING SEAPLANE OPERATION

Robert S. Fogg

A RECENT survey by the Aeronautical Chamber of Commerce states that 2,500,000 persons flew in airplanes operated by air service operators engaged in short "hop" business in 1930. These planes were in the hands of 600 aerial service operators. The survey revealed that of the 5,324 airplanes there were only eighty-five seaplanes. These figures show conclusively that here is a type of profitable operation that is being sadly neglected by the "air wise." Inasmuch as my small company is typical in the joy hop business I feel it fitting to pass on the results of our eight years of water work in the hope that it will benefit operators who may have planes standing idle waiting for passengers to come to them.

I discovered in 1922, along with many others, that the crowds no longer flocked three miles to some hay field to pay five dollars for a ride in my Hisso-Standard. I then decided that if the people would not come to the plane, the next step would be to take a plane to the people. Where there are crowds there is money. In the summer, vacationists seek the water. There are two classes—those who prefer the beaches and ocean and those who like woods, mountains and fresh water lakes. Forty miles north of our airport there is a large lake dotted with 265 islands.

À careful survey revealed a startling summer population, consisting of boys camps, girls camps, private estates, and vacationists—in other words, "pleasure seekers." The main line railroad from Boston and New York comes in at one end of the lake and most of the wealthy population resides at the other, an hour's ride either by automobile or motorboat and twelve minutes by seaplane, a fact which makes our taxi service popular. On Sundays there are motorboat races and the station platform and shore front are lined with several thousand spectators. Here between two long protecting piers and almost on the station platform we constructed our seaplane ramps "under the nose," so to speak of the crowds.



Fogg (left) and other pilots of Newhamco Air Service

Operations began in 1923 with a Hisso MF boat and from the first it was a huge success. In fact, we had to build long benches, where many customers waited two and three hours for their turn to go up. I then discovered that hundreds of people would go up from the water who would not get in a landplane. I formerly thought that perhaps fifty per cent of these people were air-minded enough to know that they were safe in the event of motor failure but that the rest simply thought the water softer to hit. I think now that ninety per cent of the people know that we can always glide to a safe landing on the lake. To emphasize this point we have adopted a slogan on all our advertising matter, "Enjoy Seaplane Safety!" The first question in the mind of the general public is "What if the motor stops?" Show them that it does not make any difference if it does and you have a customer.

I remember starting operations one Sunday morning last summer. Incidentally, on a good Sunday we do not get out of the pilot's seat, except while gassing up, for five to ten hours at a stretch. My first two loads on this Sunday in our six-passenger Travel Air made remarks to the effect that they hoped to have a good ride because they had driven a long way. On inquiry I found that the first party had driven one hundred miles and the second eighty miles and that both had come from towns with good airports and operators. I said, "Why didn't you go up in your home town?" and the answer was, "Oh,

your home town?" and the answer was, "Oh, the women wouldn't go up in a landplane." That same night as we were just about to cover the motors a man strode down from the platform where he had stood all day long and said, "Well, I swore I'd never go up in one of these damn things but gimme a ticket." He had watched the plane go up and down sixty-two times that day and on the sixty-second trip finally decided that it might be safe. That man could not have been induced even to go out to an airport.

Our present equipment consists of a six-place Travel Air, J-6 seven-cylinder Waco and a J-5 Waco, all on Edo floats and using Heywood starters. A starter operated from the pilot's cockpit is absolutely essential for fast seaplane operation. (Continued on page 136)



Lakes frequently draw a large summer population and assure profitable seaplane operation.

## THE ASPECT RATIO Article Thirteen on the

OST papers and books on aerodynamics agree that the aspect ratio of airplane wings has an important bearing on its per-The aspect ratio is the formance. ratio of the wing span to the average

Principles of Aerodynamics Bv

Dr. Max M. Munk

smaller. In order that the landing speed may remain the same, the new section may be one of higher maximum lift. The weight of the wing may also remain the same. Our formula for the induced drag then gives the

chord or, more properly, the ratio of the span square to the wing area. There is almost universal acknowledgement that a large aspect ratio is favorable to good aerodynamic efficiency. "A large aspect ratio keeps the in-duced drag down." A large aspect ratio is prescribed not only for the wings, but also for the stabilizing area. Aspect ratio has become the most popular technical term by which the results of theoretical wing theory are expressed.

Although there is much truth in the statement that good efficiency is attained with a large aspect ratio, like all popular truths the rule has to be applied with caution, for it is not unconditionally true. In the expression for the induced drag,  $L^2/(V^2\rho/2)b^2\pi$ , the square of the lift, divided by  $\pi$  times the square of the span and by the dynamic pressure, the aspect ratio does not appear at all, and that should make us somewhat suspicious. If the connection between the magnitude of the induced drag and the aspect ratio were entirely natural and direct, this connection would be shown by the presence of the aspect ratio in the expression for the induced drag. The absence of the aspect ratio in that expression indicates that such connection, if correct at all, exists only by virtue of some additional relation or fact, standing between and connecting the induced drag and the aspect ratio. The relation is then conditional on the existence of such additional fact, and the identification of such other effect is then indispensable for the judicious application of the aspect ratio rule.

In our search for a connection between the aspect ratio and the induced drag, we find an important clue when examining the expression for the coefficient of induced drag. This coefficient is

 $C_{\mathfrak{d}_{i}} = \frac{C_{\mathbf{L}}^{2}}{\pi \ b^{2}/S}$ 

It is proportional to the square of the lift coefficient, and inverse to the aspect ratio. There we have the aspect ratio. We find that the induced drag coefficient is diminished by a large aspect ratio, the lift coefficient remaining unchanged. That sounds as if the general rule were confirmed. It does not quite prove it, however. The question arises: Is the coefficient of induced drag and induced drag by itself the same in this connection? What improves the performance of an airplane-the reduction of its coefficient of induced drag, or the reduction of the induced drag itself? Obviously the reduction of the drag itself does, for the product of this drag by the speed gives the consumed power. The reduction of the coefficient of induced drag is not necessarily an improvement, it is only insofar as such reduction reduces also the induced drag itself. It does not do that necessarily, however. We are now discussing variations in the design characteristics of an airplane, with the object of improving its performance. A designer may well hit on the idea of enlarging the aspect ratio of the wing by leaving the span as it is and by making the chord

same result as before, in spite of the larger aspect ratio. This agrees with the formula for the coefficient of induced drag. The drag coefficient is larger, because the increase of the square of the larger lift coefficient more than makes up for the increase of the aspect ratio. The drag is not larger, because the area is correspondingly smaller. Here we have, then, a case where the mere increase of the aspect ratio fails to result in a smaller induced drag or a better efficiency.

A study of the relations leads indeed to the conclusion that in the recommendation of a large aspect ratio things are implied that should not be implied, and are only imperfectly true; and relations are coupled with each other that actually belong separate. The primary dimension determining the induced drag is the span and not the aspect ratio. With a given lift, the span should be as large as otherwise practical, in order to obtain the best climbing and ceiling performance. The size of the span is a direct indication how far this consideration has been complied with. The rule does not lead to the recommendation of a large aspect ratio, except if the magnitude of the wing area is already decided on; but the wing area is not absolutely determined for given conditions. It is determined by the wing loading, and this again is determined by the required minimum supporting speed in connection with the maximum lift coefficient of the wing section. While it is now true that all conventional wing sections have about the same maximum lift coefficient, there are still variations of 10% and more, and further, are also unconventional sections in use. The wing loading of airplanes belonging to the same class should therefore show distinct variations, and hence also the comparative size of the wing areas. The same part the wing loading plays for the landing speed is played by the span square loading, L/b2, for the magnitude of the induced drag. Only if the two loadings are prescribed is the rule for a definite aspect ratio well founded. Otherwise it is as vague as the wing loading varies, and has to be used with great caution. It is entirely unreliable with unconventional wing sections, as slotted wings and the like. It results, therefore, that the recommendation of a large

aspect ratio, or of a definite aspect ratio might be termed a three-quarter truth, because dependent on the universality of aerodynamic wing section properties that are far from being universal. Employing the span square loading as criterion is more direct and does not lead to errors. The rule of a beneficial large aspect ratio breaks down and becomes misleading when discussing the effects of changes in the wing section. Different wings may be used at a different lift coefficient, and the aspect ratios for equal induced power requirements are then different; a smaller aspect ratio may still have the smaller induced drag. A larger span square loading always has the larger induced drag at the same speed and atmospheric condition. The recommendation of a large (Continued on page 131)

## AIRPORT DEVELOPMENT

TTH the steady growth of commercial aeronautics and the establishment of airways crisscrossing the United States, the necessity for well-designed airports

William E. Arthur National Airport Engineering Co., Ltd.

of the time prohibitive.

(b) Mists: Morning mists obscuring twenty per cent of days prohibi-

(c) Smoke: Field must be clear of any smoke-pall zone; beyond or on windward side of any area where thick atmosphere or atmospheric pollution from tactory sections or densely populated areas is known to be prevalent in a calm. Outside of area of fifty per cent sunlight obscurity, if this is not counterbalanced by other factors.

(d) Winds: Steady winds preferable; abnormally gusty objectionable-prohibitive if frequent.

Soil and Drainage (15%)

Field should absorb all normal rains quickly; drain off completely without holding water on top soil after deluge.

Freedom of Air Approach (10%)

(a) Artificial: Prohibitive to have any structure of a height greater than one-seventh of its distance from field, obstructing over thirty or forty degrees of direction of normal approach. (Field elevation must be taken into consideration.)

(b) Natural: Adjacent topography not to include hills or woods seriously interfering with approach visibility of major part of the field. (Field level considered.)

Elevation (10%)

Topography: Preferable, elevation above most of adiacent land for several thousand feet in all directions. Other considerations equal, the higher the elevation the better.

Environment (5%)

(a) Hazard: Neighborhood improvements preferably low structures or area permanently restricted to no structures.

(b) Nuisance: Neighborhood dwellings or other occupied structures far enough away to avoid noise made by aircraft on the field.

Conditioning (5%)

(a) Cost of leveling: Minimum possible. Expenditure of many millions for full-size expansion prohibitive,

(b) Time: Initial size of field ready for use within six months; expanded areas as fast as growth requires.

Relation to Vested Interests

(a) Private utilities: Due consideration for harmonizing with established railroad rights-of-way, etc.

(b) Public: Harmony with existing public highways and future city improvements.

(c) Private improvements: Demolition of existing valuable structures minimum possible, other factors equal.

Water Landing Proximity Accommodation of seaplanes of no

#### fore its design requires careful study of many factors. To be exact, from the selection of the site to the installation of the radio telephone, there are 132 factors to be consid-Site Selection

becomes apparent. The future city without an airport will

be in the same class as the coastal city without a well-

equipped harbor. Cities and nations, like individuals,

achieve material progress in proportion as they possess pioneering minds and courage to make plans and follow

We must bear in mind that the development of an air-

port is comparable to the development of a small city; there-

There are twelve salient factors to be considered in the selection of a site for a major commercial airport. These are listed below in the order of their relative importance with percentage values shown in parentheses.

Accessibility (20%)

(a) Distance: For passengers, within thirty minutes. Mail within thirty minutes of central post office and available to pneumatic tube in the future. Express, within thirty minutes from express stations.

(b) Transportation to and from field available.

Area (20%)

them through.

ered.

(a) Runway lengths: Initial, 3,000 feet; minimum, 2,-000 feet. Later, 4,500 feet plus; minimum, 3,000 feet.

(b) Size for capacity operation: Initial, 150 acres; contiguous expansion up to 400 acres.

Meteorological (15%)

(a) Fog: Visibility of field zero more than eight per cent



Air view of United Airport showing its alfalfa-turfed field with hard-surfaced runways

consequence, since amphibions provide all necessary transportation from field if landing elsewhere on water is imperative. Ample water landing in numerous other places. Usually normal water landing prohibitive, on account of mists and fogs for the necessary constant use of the main port's commercial work.

#### Cost

The lower the cost, the better. If other factors aggregate equal advantage, a substantially lower cost would at least warrant immediate even though temporary selection. A high cost should also be balanced against the salvage value in case a temporary port is later supplanted by a more advantageous one, with the possibility of increased value helping for the establishment of a more expensive port for the future.

#### Time

The necessity for a little more time to create the best port as a main terminus should not discourage the selection. With the site for the new project selected, the problems

of constructing the airport itself must be considered. The first step is

#### Grading

Grading, an important factor in airport development, has been overlooked from a truly engineering point of view in the past. The writer, who has just completed a tour of the United States in which he landed at many airports where large expenditures have been made, was astonished to see how little consideration has been given to the importance of properly grading an airport.

The significance of grading becomes apparent when one stops to consider that many thousands of dollars can be saved in maintenance and in drainage cost by a careful study of the future development of the airport and so planning the grades, whether they be for runways or all-way fields, as to develop a surface run-off area that will carry-off the heaviest rain almost as fast as it falls.

#### Drainage

Drainage is by far the most important factor in the design of an airport. In fact, any airport not properly drained becomes a hazard instead of a haven for airplanes during heavy storms when they need proper landing surfaces. In many cases, damage to planes and injury to individuals landing on poorly drained fields represents a sum which would have paid for an efficient drainage system if it had been considered in the development of the airport.

A drainage system to insure the quick elimination of surface water during severe rains must be carefully planned so that all airport roads, taxiways, parking areas, runways, and the areas adjoining the runways are cleared of water in the shortest possible time. It would take volumes to properly describe airport drainage; we therefore attempt only to emphasize briefly its importance.

#### Preparation of Runways

We will see this year many planes flying here in the United States on regular airlines carrying thirty-two or more passengers with baggage and mail. These planes fully loaded will weigh close to 30,000 pounds. There are some ships under construction which will weigh almost twenty-two tons. These ships will require speeds of approximately eighty miles per hour to take off, and landing speeds of approximately seventy miles per hour.

The impact load of these heavily loaded planes approximates from one and one-half to three times the load of the ship. This means that especially prepared surfaces are absolutely necessary. The mere sprinkling of oil or calcium chloride or grass seed on a surface that is due to receive tremendous loads at high speed is a thing of the past. Our future surfaces be thoroughly analyzed and, using a different type of construction, must be built to far greater strength than our roadways.

There are many different methods of preparing runway surfaces. These include surfacing with turf, cinders, oiled earth by penetration or palletive method, asphaltic concrete, cement concrete, and the asphaltic plastic mix type of run-

Turf: A form of surfacing which is universally applicable, although it may not be universally desirable, is turf. Turf of one kind or another may be grown almost anywhere, and offers a firm, resilient surface, practically free from dust, with a fair traction surface. It is frequently objected that turf is not sufficiently durable for airport surfacing material. And it must be admitted that it has some disadvantages. During wet or rainy weather it has a tendency to provide a slippery surface due to the fact that the grass holds a certain amount of moisture, resulting in a tendency to groundloop or overshoot the field by skidding.

Cinders: The cinder type of runway also has both advantages and disadvantages with the latter outweighing the former. One of the real advantages of a cinder built runway is that it acts as an emergency runway surface that can be quickly built over soft, spongy, wet areas, and will serve as a base for future runway surfacing. Becase of its disadvantages, the writer does not recommend a





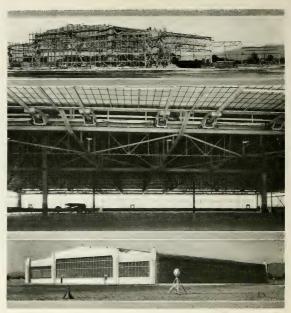
United Airport administration building exemplifies the new architecture suggested by the lines of the airplane

cinder runway for permanent use, but merely as an emergency measure or preliminary base for future runway surfaces. It has the disadvantage of absorbing artificial light, resulting in very poor visibility at night under floodlights, and has a high maintenance cost due to its lightness and porosity, It is also readily damaged by the tail skid, and in freezing weather has a tendency to freeze up in chunks or balls which have in some cases broken wheels and torn off tires in landing and taxying. This material is easily picked up by the wash of the propeller and thrown down the slipstream, taking the gloss off the fuselage, filling the cabin with a fine grit, and settling into the valves and operating parts of the motor.

Penetration: The oiled-earth type of runway is a good, preliminary low cost type of surface and is being used on a number of fields throughout the country. This type of runway is not adequate, except in rare cases, for high speed heavy commercial traffic, but has proven very desirable for small fields or areas used by light ships. The oiled earth is not thick enough to eliminate water spots or soggy, muddy areas after rainfall, but makes a very desirable surface for the initial development immediately after the grading has been completed, affording surfacing while the settling inevitable to all graded areas is taking place.

Asphaltic Concrete: Asphaltic concrete to date has not been used very extensively for runway purposes. However, it is very satisfactory for areas around langars, administration buildings, stations, and areas where a great amount of taxying is done. It makes an economical working strip in front of hangars, and also is ideally adapted for taxiways to the runways. Asphaltic concrete used as a base for the plastic or elastic type of surface insures long life and low maintenance for this type of runway. There are certain locations in various parts of the country where the asphaltic concrete type of runway would be ideal. This is a matter for the airport engineer to analyze carefully during the designing and engineering of the airport.

Cement Concrete: The cement concrete type of runway is now undergoing experiments at some fields. This surface is very hard and does not have a great deal of traction in wet weather. There is a tendency for planes to ground-loop on this type of runway after they have lost a certain amount of forward speed. Also, the initial cost of a runway of this type of sufficient width to be safe under all conditions is rather high in comparison to other types of runways. During certain weather conditions wear on the tires is excessive when brakes are applied. In view of the fact that all planes do not land at the same forward speed—the variance being from approximately twenty-seven to eighty-five miles per hour—care must be taken if this type of runway is used to make it of sufficient width and length to meet all their requirements.



The cantilever hangar can be expanded to suit the needs of the growing airport. Views of hangar at United Airport, Burbank, California

Asphaltic Plastic Mix: The asphaltic plastic mix type of runway is, in the writer's opinion, by far the best type of runway for airplane traffic yet developed. These runways, of course, require considerable laboratory experimentation before definite specifications can be laid down. These experiments consist of analyzing the soil from a chemical and mechanical angle in order to determine the method of mixing and blending the various asphalts and oils to arrive at the proper consistency for a resilient non-skid surface. In preparing runways of this material, the base must be properly prepared by means of a hard oil or asphaltic concrete. and, in some cases, crushed rock or porous gravel to permit drainage. Water tables over the entire area must be lowered and maintained at the proper depth. This process may sound difficult, but it is in fact very simple and inexpensive. After the base has been properly prepared, the surface is applied. This surface may vary in thickness from three inches to six inches or possibly eight inches, depending upon the geographic location and the type and amount of traffic using the runways. This top surface has an elasticity that permits the indentation of the wheels and tail skid or wheel upon landing to a degree that will prevent side-skidding and eliminate groundlooping to a fair extent, and also provides sufficient traction for remarkably quick stopping of the plane.

In freezing and very severe weather conditions where there is an upheaval of the earth due to frost, the runway moves with the earth and is quickly rolled back into place without any serious damage to the runway surface. The even texture and color of this surface, contrasting with the surrounding portions of the field, makes the runways readily discernable from high altitudes and great distances.

#### Buildings

As the buildings of an airport are many and varied, this article will discuss only the more important. In designing an administration building, future expansion must be kept in mind to the extent that each addition will conform to the original architecture and be part of an ultimate plan. It is well in laying out plans for an administration building and station to start with a center or key unit, which would contain sufficient space for waiting rooms and passenger facilities, together with such management offices and traffic control space as is necessary to operate the airport economically and efficiently during its initial development. As the traffic increases and the business of the airport develops, such additions as are necessary can be added to the building, which then becomes an administration group. All details, however, must be carefully planned in a basic design so that various corridors, passageways, elevators and rooms will properly interlock and dovetail with one another when the group is completed. This same thought must be carried out with regard to driveways, loading and unloading platforms, tunnels, and stages, so that when completed the group is pleasing and attractive to the eye.

#### Hangars

Due to the rapid development in aircraft, it is almost impossible to anticipate what the future holds in the design of airplanes. Today we have airplanes ranging from the small plane with a twenty-two-foot wing spread and a height overall as low as six feet to the large commercial plane with 137-foot wing spread and a height of twenty-two feet six inches. With such a variance in airplanes, hangars must be so designed, at least for the present, so that they will accommodate the range of planes between these varying dimensions. As in the design of the administration group, the hangar should be planned so that it can expand with the growth of the airport.

There are many types of hangars, but the most efficient type yet developed is the cantilever type. It can be built in units, each unit being 100 feet square and by a combination of such units, a hangar of this type can be constructed from 100 feet in length to 1,000 feet or more and from 100 feet in width to 300 feet. The most economical height is twenty-six feet. With this type of hangar, the operator has a clear door opening without obstructions of any kind ranging the full length of the hangar. It is well to start with one such unit in the initial development, allowing the hangar to grow with the airport.

#### Architecture

With the development of air transportation, the architectural mind has been opened to an entirely new and distinctive type of architecture. In carrying out the architectural design of an airport the subject in mind is the airplane. The beautiful stream lines of the ships, the long, low, graceful lines of the wings, should be reflected in the lines of the building.

#### Landscaping

Landscaping around the buildings of an airport is inexpensive yet effective. If properly planned it will emphasize the architecture, as well as give to the surroundings a pleasing and soothing atmosphere. It should present to the imagination of the air traveler his innate desire to leave the dust-laden and noise-filled atmosphere of this mundane world for the height of some billowy cloud. When the visitor approaches the airport, his eye should be attracted by low shrubs and guided gradually to the tops of tall trees at the entrance of the buildings.

#### Illumination for Night Flying

Various geographical locations and altitudes affect illumination for night flying to a marked degree. In moist and dense atmospheres certain colors lose their penetration and intensity whereas other colors are intensified and have increased penetration. In planning the illumination of an airport, therefore, it is essential to take into consideration the prevailing atmospheric conditions. These must be analyzed from meteorological data gathered over a long period of time.

While the Department of Commerce, Aeronautics Branch, has laid down certain basic rules and regulations in reference to airport lighting equipment, the designer in using these rules and regulations must, in addition, consider all important factors that enter into airplane operations at night to and from an airport. Most fields today are equipped with boundary lights, obstruction and approach lights, field lights, and beacons; but the airport of the future must go beyond these. The airport must stand out distinctively, beyond doubt in the pilot's mind, from all other surrounding groups. To illustrate: there are illuminated baseball parks, football fields, golf courses, and amusement parks which vary in size, and under certain illumination appear larger than they actually are. A pilot. approaching a locality for the first time at night, should be able to distinguish an airport from any other illuminated group by its distinctive lighting, and care should be taken that an illusion is not created as to the actual size of the landing field.

#### Radio

Air transportation today is becoming more efficient and reliable through the use of radio. In the design of the future airport, radio plays a very important part. There must be an area of the proper dimensions and location where the numerous and delicate instruments may be installed. The towers must be so located that the 'radio beams emanating from them will guide the pilot to his destination but that they do not become an obstruction to traffic approaching the airport. The importance of radio is becoming more obvious each year. Provision should be made for the installation of complete radio equipment, for the future may demand a two-way radio telephone system from the plane to the business man's office.

#### Public Address System

More and more uses are being found on the airport for a really worthwhile public address system—controlling the crowds, announcing the arrival and departure of planes and interesting news announcements in the daily routine, and describing the events on days when air meets are held. Once a public address system is installed it is found to be indispensable in the operation of an airport. Cheaply constructed and improvised systems are the most expensive in the long run. The best system that can be procured can pay for itself in a very short time, because complete understanding of events by the crowds observing airplane activities on the field greatly increases their enthusiasm and stimulates their interest.

#### CURRENT AIRPORT AND AIRWAY FACTS

Transport Operators Increase Services, Anticipating Summer Travel

A NTICIPATION of heavy summer travel over the nation's airways system has resulted in the inauguration of a number of new services, the operation of more numerous and advantageous schedules, and offering of attractive rates for air tourists.

The activity extends to both the small feeder lines, which are adding services to link more cities to the "trunk" lines, and to the larger transport groups, which continue to expand their systems. Twice within the month has the title "world's largest airline system" been transferred, United Air Lines having outstripped the newly-expanded system of American Airways when transport groups of United Aircraft and Transport were consolidated and extended.

The number of schedules operated showed a sharp increase, especially between large cities with a community of interest or between cities and resorts. Several lines increased their daily service to four or six schedules daily and two new services were inaugurated on the hourly departure plan.

That airlines are making a definite bid for the patronage of the vacationist is evident in the increase of service to resorts and in the revision of fares, announced at least in one case as "excursion rates."

One new company has been organized offering high speed service that will bring air travelers from Mexico City to New York within thirty-four hours. Continental Airways of Chicago has purchased retractable gear Lockheed Orion transports and will operate from Chicago via Columbus and Pittsburgh to Washington, D. C. Advantageous connections with New York and Western Air Lines on one end and Braniff Airlines and Corporation Aeronautica de Transportes on the other will afford the speedy service from the Mexican capital to New York.

A second company to operate between points in Mexico and the United States has also been announced. The Mexican Central Airways, an Arizona corporation, will begin operation with express and mail service, using new-type Ford freight ships, and will later enter the passenger field, operating Lockheed planes, according to press dispatches.

Regular air passenger service between New York and Atlantic City, beginning with one round trip daily and gradually increasing to six round trips each day during the latter part of the summer, was inaugurated on June 1 by New York Airways, Inc. Schedules call for fifty-five minutes flying time between the Glenn Curtiss Airport at North Beach, Queens, and Bader Airport, Atlantic City. During June one round trip daily will be run. On July 1, the service will be stepped up to four round trips daily and beginning August 1, six trips will be scheduled in each direction. Substantial reduction in tariffs, as compared with last year's rates, are in effect.

Hourly service to Atlantic City is being

operated from Philadelphia by the Ludington Air Lines, increasing that company's daily schedules to fifty. The company has also expanded its services in acquiring control of the Dixie Flying Service, Inc., which transports passengers from Greensboro, Virginia, to Washington. For the present only one round trip daily will be operated on this line.

Eastern Air Transport on June 15 added new schedules on its Washington, Richmond and Greensboro route to allow afternoon travel between those cities and Baltimore, Philadelphia, and New York.

American Airways on June 15 opened a new line between New Orleans and Memphis



New type 36000 GRL airport floodlight manufactured by Pyle-National Company of Chicago

and extended its line southwest from Nashville to Fort Worth. A trip each way daily on both lines is scheduled. The company has also inaugurated on its Universal division new schedules and summer excursion rates. Four schedules daily are being flown on the Chicago-Springfield-St. Louis line and a five-day excursion ticket is offered to morning travelers. The company now flies 23,020 miles daily.

National Air Transport is also encouraging air travel through a ten per cent reduction in fares. Under the new rates the fare between New York and Kansas City, for example, was reduced from \$90.16 to \$82,00, and between Kansas City and Dallas from \$33.65 to \$22.50.

The Oklahoma-Texas Airline, which has been operating between Oklahoma City, Oklahoma, and Wichita Falls, Texas, is extending its service from Oklahoma City to Ponca City, Oklahoma.

Air mail service was added on June 8 to the passenger service of the Pittsburgh-Washington Division of Pennsylvania Airlines, giving through air mail service be-

tween Cleveland and Washington, by way of Akron and Pittsburgh. Three round trips are now flown by this company between its terminal cities.

#### United Air Lines Forges World's Largest Airline System

CONSOLIDATION of management, operation, traffic and sales activities of four eastern and western air mail, passenger and express lines flying approximately 12,000,000 miles annually or 33,000 miles daily was announced on June 1 by F. B. Rentschler, President of United Aircraft and Transport Corporation. The four transport units are designated as divisions of United Air Lines, which becomes the largest air transport operator in the world in point of mileage flown. General headquarters are maintained in Chicago.

Airlines involved are: National Air Transport—New York to Chicago, Chicago to Dallas; Boeing Air Transport—Chicago to San Francisco; Pacific Air Transport— Seattle to San Diego; Varney Air Lines —Salt Lake City to Seattle and the Pacific Northwest.

#### Air Mail to South America Improved by Reciprocal Use of Airways

IMPORTANT improvements in the international air mail service to South America were provided in the signing of an agreement by the United States Post Office Department and the Colombian Postal Administration for Air Mail, represented by Societe Colombo-Alemana de Transportes Aereos, known as Scadta. By this agreement reciprocal use of the international air routes went into effect on June 15.

Saving of two days over the previous air mail time between United States and Colombia, a substantial reduction in air mail rates, and greatly increased service were effected by the agreement.

A uniform air postal tariff of thirty-five cents a half ounce has been established for mail from this country to any point in Colombia.

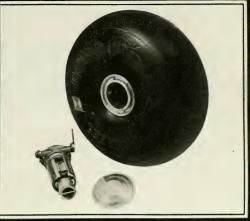
#### Air Express to Latin America Opened by U. S. Air Mail Service

TO speed trade and commerce between the United States and the chief markets of Latin America, an air express service has been established for exports to seventeen countries on the United States international air mail system. Regular air express service on fast air mail schedules was inaugurated on June 4 to Haiti, the Dominican Republic, Porto Rico, Antigua, St. Lucia, Trinidad, British and Dutch Guiana, Brazil, the Bahamas, Jamaica, Nicaragua, Costa Rica, Mexico, Guatemala, Salvador and Panama.

The new international air express service saves one and a half to two days out of every three previously required for transportation.

A scale of rates appreciably lower than any previously connected with air express, has been established for export shipments. In conjunction with Railway Express Agency, Inc., a nation-wide system of collection points is being arranged.





# Here's what we mean by "AIRWHEEL SAFETY"

Let your eye run down that list of landing hazards which threatened every pilot and plane before Goodyear developed Airwheels.

Then notice how few hazards are left on the list today.

Seven out of ten are banished by these big soft rolling rubber pillows — Goodyear Airwheels and the new Airwheel roller bearing brake.

Good luck and a good pilot may bring a ship through such landings without Airwheels—but the odds are three times as good if you have this Goodyear equipment.

Goodyear builds Airwheels to operate at inflation so low that you can roll the plane safely through mud, over sand, or across plowed ground without nosing over. And most pilots now know that this great wheel-and-tire-combined called an Airwheel makes cross-wind or down-wind landings a cinch.

Power, smoothness and sure release are combined in the new Airwheel brakes—the brakes developed exclusively for aviation. With these brakes you can slide the wheels or bring up the tail (depending on landing surface) and still keep complete control. You can hold the ship at full throttle—let it roll and stop it again! How's that for power?

Only Goodyear can give you Airwheel safety. And now you can get it for no more than you pay for ordinary tire and wheel equipment. Can you afford to fly without it? For engineering data, write or wire Aeronautics Department, Goodyear, Akron, Ohio, or Los Angeles, California.

When you buy a new ship specify Goodyear Airwheels



EVERYTHING IN RUBBER FOR THE AIRPLANE

## DIGEST OF FOREIGN TECHNICAL ARTICLES

#### WHEELS AND TIRES

Aircraft Wheels and Tires, G. H. Dowty. Aircraft Engineering, Vol. 3, No. 27, May, 1931, pp. 114-116, 11 figs.

URRENT practice in the design of CURRENT practice in on shock about the of wheels, tires, brakes, and shock about the or the original transfer of the original transfer original transfer of the original transfer of the original transfer original tra sorbers is reviewed with comments on the merits and demerits of the various types. British and American standards for wheels are compared. A new type of wheel now undergoing tests in England, in which the rim is supported on two disks, is described. The brake drum is incorporated in the wheel side and the continuation of the brake drum wall is used to form the hub, which rotates on a large diameter bearing provided with a vertical slot to allow the axle to rise and fall against the action of two rubber columns. One oleo cylinder is arranged centrally in the wheel and is double acting on the up-stroke to absorb energy of landing and on the rebound to check spring recoil. The chief advantages of this type are said to lie in a cleaner and lower drag undercarriage assembly, the location of shock absorbers in their best possible position, the provision of a rigid structure, and a simplified means of removing shock absorbers.

#### SHOCK ABSORBERS

Shock Absorbers for Aircraft Landing Gears, W. S. Hollyhock. Flight (Aircraft Engineer Supplement), Vol. 23, No. 1165, April 24, 1931, pp. 27-31, 8 figs.

THE principle upon which oleo-pneumatic shock absorbers are based is discussed and a method for designing them is developed. The design of a leg is considered in which the oil is forced through a needle valve directly into the air reservoir without any piston or other separating medium between the oil and the air. The author states that this type has distinct advantages in simplicity and lightness, and that the objection to it, namely that the oil is liable to froth on entering the air chamber, does not seem to be the case in practice.

#### WIND TUNNEL INTERFERENCE

Maximum Lift in Closed and Open Jet Tunnels, F. B. Bradfield, K. W. Clark, and R. A. Falirhorne. (British) Aeronautical Research Committee—Reports and Memoranda No. 1363 (Ac. 491), December, 1930, 19 pp., 6 figs.

VARIOUS tests in connection with wind tunnel interference on the maximum lift of airfolis are reported. It was found that the maximum lift coefficient of a slotted wing may be increased considerably by tunnel interference. For a six by 36 in. wing, the maximum lift coefficient measured in a four-foot tunnel may be greater by 0.1 or more, than when measured in a seven-foot tunnel.

The maximum lift coefficient of a wing of lower lift coefficient, such as the R.A.F. 30, R.A.F. 32, Aerofoil A (a modified form of R.A.F. 15), increased with decreasing size of tunnel, but to a much lesser extent. Taking the same comparisons as before, the increase would be 0.025, or a quarter of that found for the slotted wing. The maximum lift coefficient measured in an open-jet tunnel varied little from the free air value.

#### By Elsa Gardner

#### SPINNING

Spinning of a Model of the Fairey III-F Seaplane, H. B. Irving and A. S. Batson. (British Aeronautical Research Committee — Reports and Memoranda No. 1356 (Ae. 487), June, 1930, 15 pp., 27 figs.

THE results of tests to provide data on the spinning properties of a twin-float seaplane, and to investigate the effect of modifications of the tailplane on the moments given by the tail in a spin, as well as the effect of differential and floating ailerons and interceptors in a spin, are discussed Of the three forms of aileron control the floating ailerons appeared to offer the greatest improvement as regards recovery from a flat spin. Differential ailerons were the most beneficial at the lowest incidence (42.4 degrees) but gave a rolling moment at 60.9 degrees less than ordinary ailerons with some reduction of the vawing moment. The effect of interceptors fell off as the incidence increased and was small at 60.9 degrees. The model was not fitted with slots, however,

Large positive pitching moments due to the floats were found at high angles of incidence. Of the total pitching moment due to floats, about one-third was accounted for by interference of floats on the the taliplane and the floats also reduced the elevator control in the region of 35 to 55 degrees incidence. The spinning calculations, based on the results of the rolling and sideslip experiment on the model with and without floats, did not indicate that there would be any difficulty in recovery from spinning for this seaplane, although the margin of safety in spinning was less than for the corresponding land machine.

Spinning Experiments on a Single Seater Fighter.
Part I.—Further Model Experiments, A. S. Batson and H. B. Irving. Part II.—Full Scale Spinning Tests, S. B. Gates. (British) Aeronautical Research Committee—Reports and Memoranda No. 1278 (Ac. 424), August, 1930, 10 pp., 12 figs.

THE tests discussed were made on a single-seater fighter staggered biplane which, in its early forms, gave difficulty in recovery from spins, as described in previous reports. The model tests were made on a form of the machine in which not only the fin and rudder areas were increased, but the body was lengthened and the tailplane raised from the middle to the top of the rear portion of the body.

These modifications resulted in greater enhanced damping moments due to body, fin and rudder, while rolling, roughly as much of the increase being caused by the lengthened and deepened body as was due to the enlarged fin and rudder. The raising of the tailplane contributed to these increases in no small measure.

The full-scale experiments made at the Royal Aircraft Establishment showed that these modifications had considerable effects on the spinning of the machine, but that, stithough no actual difficulty in recovery was found, recovery was slow. Previous experiments at Martlesham with a slightly smaller fin and rudder had shown that danger had not been entirely eliminated. Even with the larger fin and rudder, the machine could not be regarded as having been far removed from the danger point.

#### AIRCRAFT CARRIERS

Deck Flying, W. R. D. Ackland. Royal Aeronautical Society Journal, Vol. 35, No. 245, May, 1931, pp. 372-391, and (discussion) pp. 391-400, 28 figs.

THE development of the modern aircraft carrier from the improvised auxiliaries, commissioned to meet war exigencies, to the present type of carrier is traced. The author considers that the main difficulty in landing on a deck is due mainly to its narrowness, its length being ample, and states that today, under all conditions, about 99 per cent of the landings are quite successful. The author's own experience has been that, provided great care is taken over each landing, there is no difficulty, but once care is relaxed a bad landing is inevitable. The author described the actual process of landing on a deck and explains the features which are desirable in aircraft to make this as easy as possible.

#### CANARD TYPE AIRPLANE

The Principle of the Canard and Its Advantages (Leprincipe du "canard" et ses avantages), H. Focke. The Cost of Longitudinal Stability of the Airplane and of the Canard (Le prix de la stabilité longitudinale de Favion et du "canard"), W. Margoulis. L'Aeronautique, Vol. 13, No. 144, May, 1931, pp. 165-171, 10 figs.

T HIS is a further discussion of the principle involved in the design of the canard type of airplane which was described in the January issue of Arbo Didest. An abstract of a German article dealing with the longitudinal static stability of this type was given in the February issue.

In this case, the first author, H. Focke, is the director of the company producing the plane. He explains the design of the plane, which carries the elevators and fin in front, gives reasons for its unusual static longitudinal stability, and comments upon its advantages in regard to the reduction of the dangers of stalling and to economical performance. W. Margolis compares the longitudinal stability of this type of plane with that of the ordinary plane.

#### AIRSHIPS

Airships in Horizontal Flight, T. L. Teed. Aircraft Engineering, Vol. 3, No. 27, May, 1931, pp. 107-108, 5 figs.

THE complicated forces that come into play when an airship is pitched are discussed. The author shows why the passage from the condition of a reasonable measure of elevator control to none at all is somewhat sudden and why the mean elevator angle is no indication of the static condition of the ship. He concludes that the relationship of air speed to horsepower is a sound indication of the amount by which the airship is out of equilibrium, and that the axial pitch of the airship at any particular horsepower is an absolute indication of the degree of heaviness

(Continued on following page)

# A NEW WORLD'S RECORD WITH TEXACO



#### TELEGRAM

ON OUR LAST FLIGHT, IN WHICH WE FINALLY MADE A NEW WORLD'S NON-REPUELING ENDURANCE RECORD, AS ON PREVIOUS FLIGHTS OUR 
PACKARD DIESEL ENGINE INSTALLED IN THE 
BELLANCA PLANE RAN PERFECTLY FROM START TO 
FINISH ON TEXACO AERODIESEL FUEL, TEXACO AIRPLANE OIL AND TEXACO MARPAK NUMBER 3 ROCKER 
ARM LUBRICANT. WHAT MORE COULD ANYONE 
ASK8 WE WANT TO THANK THE TEXAS COMPANY 
FOR THE EXCELLENT COOPERATION WE RECEIVED 
THROUGHOUT ALL OF OUR THREE ATTEMPTS—

WALTER LEES AND FREDERIC BROSSY

Texaco Aviation Products include Texaco Aerodiesel Fuel, Texaco Aviation Gasoline, Texaco Airplane Oils, Texaco Marfak Greases and Texaco Asphalt products for runway construction at airport hangars. THE Packard Diesel Aircraft Engine breaks the world's record in a non-refueling endurance test! A Bellanca plane powered by the Packard Diesel Aircraft Engine and flown by chief test-pilot Walter Lees and pilot Frederic Brossy remained in the air 84 hours and 33 minutes!

The plane took off from Jacksonville Beach, Florida at 6:47 A. M. May 25th and landed at 7:20 P. M., May 28th.

Texaco Aerodiesel Fuel, Texaco Airplane Oil No. 5 and Texaco Marfak Grease No. 3 fueled and lubricated the plane throughout the flight.

It was a remarkable demonstration of the power and endurance of this new type of engine, and of the exceptionally high quality of the fuel and lubricants that kept it functioning perfectly every minute of these long, trying hours in the air.

Both pilots were highly pleased with the performance of the Texaco Products they selected for this spectacular test. Read the telegram. These same Texaco Aviation Products are distributed at principal airports in every State.

T H E T E X A S C O M P A N Y
135 East 42nd Street New York City

(Continued from preceding page) (or lightness) of the craft. He considers that the flying of a heavy airship in rough weather at low altitude calls for a high degree of precision on the part of the Height Coxswain and a very considerable amount of judgment on the part of the Officer of the Watch.

#### **AERODYNAMICS**

The Air Flow around a Symmetrical Aerofoil, T. Tanner. (British) Aeronautical Research Committee—Reports and Memoranda No. 1352 (Ac. 484), July, 1930, 11 pp., 58 figs.

THE investigation described was undertaken in the Royal College of Science at the suggestion of W. S. Farren. Its object was to determine the velocity of the air both in magnitude and direction at all points in the field around an airfoil and to find from this, according to the circulation theory, the value of the lift coefficient with a view to forming a basis for the comparison of work being carried out in the water tank at Cambridge University. The R.A.F. 30 airfoil of symmetrical section was used and the chord and wind speed were chosen so as to give the same Reynolds number and the same tunnel construction as the apparatus at Cambridge.

The circulation was determined around a contour enclosing the airfoil and for the purpose of checking the result, the pressure distribution around the medial section of the model was determined by the usual method of inserting a piece of soft metal tubing in the surface of the airfoil and taking readings on a tilting manometer of the pressure at a number of holes pierced through it. The lift coefficient was then determined by the integration of the pressure distribution diagram, giving a value of 0.359, or about two per cent more than that determined by circulation.

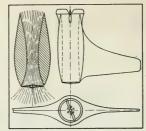
#### RADIO AERIALS

Enlarging the Effective Height of Trailing Aerials for Airplanes (Vergrosserung der effektiven Hohe von Flugzeugschleppantennen). F. Eisner, G. Sudeck, R. Schroer, and O. Zinke. Luftfahrtforschung, Marrch 3, 1931, pp. 141-154, 20 figs., 12 tables.

THE authors describe the comprehensive Versuchanstalt fuer Luftfahrt to increase the effective height of trailing aerials for airplane radio equipment and report the favorable results obtained with a L-form aeria! developed during the course of the tests. The theoretical foundation first laid out for the aerodynamic and electric investigation is given, followed by a description of wind tunnel measurements of the antennae elements. flight tests with field density measurements for the determination of the effective antennae height, and final tests on types of antennae. The proposed L-aerial has about four times the effective height and three times the ammeter measurements of the usual type of aerial employed.

#### METEOROLOGY

1931 Annual of Weather Forecasting Office (Annuario 1931 IAnno IXI) Ufficio Presagi). Ministero Dell'Aeronautica. 303 pp., 48 figs. THIS volume is published by the Italian Air Ministry and contains data useful to the meteorological and aerological observer.



New form of aircraft called the "Turbine Wing," described in L'Aerotecnica

It deals for the most part with the development of meteorological radio stations located in all parts of the globe for advising aircraft and ship pilots of the weather conditions. The positions of the sun, moon and stars during each day of 1931 are given to aid the pilot in plotting his course. Charts show a planisphere of the time of the whole world, the duration of twilight and of the astronomical day at various latitudes and signalling of time by international radio-telegraphy in various parts of the globe.

Observations of the clouds in relation to height from the ground and to the various sections of the cyclone are discussed. One section is devoted to terrestial magnetism with charts of magnetic declination and inclination. The trajectory of the cyclonic formation over Italy and its adjacent seas in 1929 and 1930 is taken up and the signs of the present interpretation of the barometric depression are explained. The time of high tides, especially those at Venice and Trieste, is referred to. Graphs for the conversion of millibars, millimeters and inches as well as Centigrade and Fahrenheit are included in the book.

#### BALANCING RADIAL ENGINES

Note on an Improvement in the Balancing of Radial Engines (Note aur un perfectionnement à l'equilibrage des Moteurs en Etoile), G. Lehr. La Technique Aéronautique, Vol. 22, Nos. 112 and 114, February and April, 1931, pp. 48-30 and 86-98, 4 flourers and April, 1931, pp. 48-30 and 86-98, 4 flourers and April, 1931, pp. 48-30 and 86-98, 4 flourers and April, 1931, pp. 48-30 and 86-98, 4 flourers and April, 1931, pp. 48-30 and 86-98, 4 flourers and April, 1931, pp. 48-30 and 86-98, 4 flourers and April, 1931, pp. 48-30 and 1

THE means employed by E. J. Fearn and W. S. Farren for calculating the disturbances caused by the eccentricity of the big ends of the articulated connecting rods in radial engines are discussed. The author develops a method which furnishes directly the values of the different harmonics in a function of the simple parameters which define the motion. A procedure is given for balancing the secondary forces of inertia in the case where the axes of rotation of the articulated connecting rods are regularly spaced around a circle having the axis of the crankpin for its center. This procedure leads to the solution of the problem in which the angle of the radius vector joining the center of the big end of the articulated connecting rod to the center of the crankpin. with the connecting rod, differs from that which the geometric axes of the cylinders make between them.

#### TURBINE WING

The Turbine Wing (L'ala a turbina), L. Stipa. Consideration of the Work of a Propeller with an Additional Tube (Considerazioni sul funzionamento dell'elica con tubo addizionale), E. Pistolesi. Aerotenica, Vol. II, No. 4, April, 1931, pp. 411-418, 12 figs. and pp. 419-423, 2 figs.

\*HE author describes a new form of aircraft termed the "Turbine Wing" in which the wing is understood to be an airplane using the same principles of action and reaction that is characteristic of turbines. In explaining the theory the author compares the motion of a fluid through a hole in a thin wall with that of a fluid through the propeller disk. Both upstream and downstream of the small hole there is an afflux of the fluid. Both through the propeller and the small hole the maximum speed of the fluid is not reached, but the maximum speed takes place at a point corresponding to the narrower section of the flow and the slipstream, and such a section is always situated at a certain distance downstream of the hole and of the plane of the propeller disk, This analogy having been established, if an additional tube is applied to the small hole, an increase of output takes place with equal flow, according to Venturi's experiments, so that by applying an additional tube to the propeller, the same improvement is obtained. If such a tube perfectly encloses the propeller slipstream and surrounds the restricted section and a certain length of the widening part, the dynamic pressure is transformed into the static pressure in widening the tube and, as the wall is inclined, this pressure gives a component in the direction of the motion.

In the article following, E. Pistolesi, an authority on the aerodynamics of propellers and airplanes, discusses the theory of the turbine wing and points out its advantages.

#### CORROSION PREVENTION

Galvanized Coatings for Iron and Light Metals as a Protection against Salt Water (Seewasserbeständigkeit galvanscher Uberzügs auf Eisen und Leichtmetallen), K. O. Schmidt. Zeitschrift füer Flugtechnik und Motorlurschiffahrt. Vol. 22, No. 5, March 14, 1931, pp. 141-147, 21 figs.

COATING for iron and light-metal airplane parts to protect them from corrosion by salt water were investigated by the Deutschen Versuchanstalt fuer Luftfahrt and the result discussed in this report. In regard to the protection of iron, the author concludes that lead oxide is not suitable for corrosion protection either as a layer over cadmium or as an interlayer between cadmium and a tar rusting compound. All types of chromium plating were found useless as a surface protection for iron; zinc galvanizing was not durable, and cadmium and tin as a surface protector was inferior to protection by cadmium alone. Cadmium plating always furnished good protection, and unprotected sheets of V2A steel were not attacked externally.

In regard to protection for light metals, cadmium was not approved as a surface protector for Elektron AZS51W. Rubber coating on duralumin and Lautal gave good protection only in a fall, but, in other respects, had only slight protecting effect. The brittle cadmium coating on duralumin and Lautal proved good in spite of the difficulty in producing it.

THOMPSON PRODUCTS, INC., MANUFACTURERS OF AIRCRAFT VALVES, USE

## TELETYPEWRITER SERVICE

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THOMESON PRODUCTS, Inc., produces a wide range of aircraft valves. To maintain a high standard of production efficiency, Teletypewriter Service\* is used extensively for communication between their Cleveland and Detroit plants.

Typewritten messages covering every phase of the business are transmitted instantly, accurately and in private—administrative instructions, sales, accounting, traffic, specifications, messages to jobbers, engineering details, production, delivery dates, changes in orders.

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## LINDBERGH'S LOCKHEED SEAPLANE

HEN Colonel and Mrs. Charles A. Lindbergh take off from New York on their vacation flight to the Orient, their Lockheed Sirius seaplane will embody numerous interesting and unique features. The nature and route of the trip require some special equipment, and Colonel Lindbergh, with his usual thoroughgoing preparation, is having still other equipment installed as a measure against all contingencies which may arise.

Perhaps the most important alteration in the plane is the substitution of Edo floats for the conventional landing gear. The Sirius is being converted to a seaplane because so much of the route lies over water or within gliding distance of water. Although (as this is written) Colonel Lindbergh has not announced his exact course, it appears likely that the flight will follow the Great Lakes as far as Lake Superior and then diverge across the lake-studded country of Canada to Alaska. From Alaska the route will probably be similar to that taken by the Army 'round-the-world fliers in 1924across Bering Straits, past the Aleutian Islands and the Keurile Islands, down the coast of Siberia, to Japan. Once in the Orient, the Lindberghs will tour Japan and China by air. On this tour, as along the route from America, the best landings can be made on water. For Japan, of course, a group of islands, and China, where it is not too ruggedly mountainous, is too marshy for safe landings anywhere except on the numerous rivers.

The technical aspects of the Edo float installation are also of unusual interest.

For the following data on this feature of Colonel Lindbergh's plane, AERO DIcests is indebted to Mr. George B. Post, vice president of the Edo Aircraft Corporation, who is supervising the work of converting the ship from landplane to seaplane.

LOATS for Colonel Lindbergh's special Lockheed Sirius were ordered during the latter part of April, specifying an installation that would be capable of meeting Department of Commerce requirements with a gross weight slightly in excess of 6,000 pounds. Tanks were specified to be installed in each float, each with a capacity of approximately 150 gallons of gasoline. The order was filled thirty days later with a stock pair of model 6075 floats, equipped with automatic water rudders and standard in every way with the exception of the special tanks, which were installed after completion. The tanks are separate from the float structure and can be removed for inspection or repair by lifting off the deck immediately above them.

The floats have a total submerged displacement each of 6,075 pounds, which, according to the Department of Commerce requirement of 90 per cent reserve buoyancy, permits a gross weight as a seaplane of 6,400 pounds, and this figure was used as the design load for all attachments; however, a generous excess of strength in these parts was provided above the Department's normal load factor specification. The design load for the float bottom was twenty-three pounds per square inch.

The general structure is quite similar to all previous Edo designs and is of the all-metal monocoque type, using the outer skin or covering for a large part of the strength, and eliminating the use of any longitudinal bulkhead or truss. The float is built around a series of transverse bulkheads, connected by horizontal foreand-aft stringers along the bottom and chines, and vertical stiffeners along the sides, to which the bottom, side and deck sheets are attached. All of the sheet metal is heat-treated Alclad and the entire structure, with the exception of the deck, is fastened with heat-treated rivets. Bottom sheets and other important units are protected against corrosion by the anodic oxidation process.

The lines of the 6075 floats were developed as a result of a series of wind tunnel tests and the Massachusetts Institute of Technology and showed an absolute drag coefficient of .034 on a (volume) basis, which is compared in the M.I.T. report to figures of .033 and .036 for the British Schneider race floats. So far as is known, the new float is faster than any yet developed in the United States and appears to be the fastest float of a strictly

The planing area forward of the step is formed into two flutes or longitudinal steps, for the purpose of reducing wetted area at high speeds. The flutes do not function until the ship is definitely in planing position with the tail of the floats clear of the water. From this point on, however, the spray begins to be thrown clear of the outer flutes and as the speed

(Continued on following page)

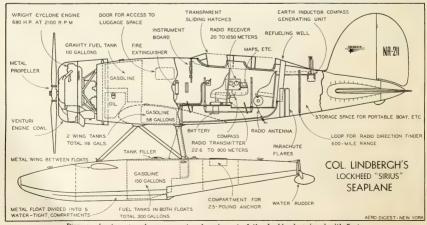


Diagram showing general arrangement and equipment of the Lockheed equipped with floats



Lockheed Sirius recently equipped with standard EDO all-metal Floats for Col. and Mrs. Charles A. Lindbergh.

# MAKE YOUR PLANE A SEAPLANE WITH

## EDO FLOATS

In constantly increasing numbers each year, airplane owners and purchasers are making EDO all-metal Floats an essential part of the landing equipment of their planes. In so doing, they are gaining double usefulness and range of service for business or pleasure.

EDO equipment is a product of years of specialization in float and flying boat hull design and construction. Sturdily built of finest materials, perfectly matched to the requirement of any type of plane, supremely able in hurrying heavy loads off the water, the dependability of EDO

and EDO Floats is proverbial throughout aviation.

Complete installations are promptly available in 15 standard sizes—easily interchangeable with the wheel landing gear of practically every well known plane. More than 40 types of airplanes are licensed for EDO equipment in the United States or Canada. Complete information will be gladly furnished on request to airplane manufacturers, transport operators and private owners. Address: EDO Aircraft Corporation, 610 Second Street, College Point, Long Island, N. Y.

NOW
AUTOMATIC WATER
RUDDERS FOR
EDO FLOATS



(Continued from preceding page)

and lift from the wings increase, the inner portion of the forward bottom becomes the only part of the float in contact with the water. In this way the wetted surface and consequent skin friction is virtually cut in two, permitting a smooth and rapid acceleration to even the highest take-off speeds.

One of the most radical changes in the new float is the angle of vee or dead rise on the bottom. Comparatively flat bottoms can normally be expected to provide the quickest take-off but at the same time develop the severest shocks in anything but a perfect landing on smooth water. Present practice in floats for commercial use reflects a compromise between the oposing factors with an angle of from 15 to 20 degrees. This angle has been stepped up to 30 degrees in the 6075 design, with an improvement in shock absorbing qualities at high landing speeds under rough water conditions.

In the conventional twin-float installation, the cross bars or spreader tubes are used for the purpose of carrying torsional

stress between the two floats. In the past it has been common practice to use a forward and a rear spreader tube to carry these forces, but in the new design they are all carried through the forward member which is a heat-treated dural I-beam with a vertical depth of approximately five feet. This beam is rigidly secured to the forward portion of the float and streamlined with a dural wing section. In the model 6075 floats the wing thus formed has an area of approximately 15 square feet. It is capable of supporting a load of approximately 400 pounds in the case of Colonel Lindbergh's Lockheed, which is just about the added weight of the normal float gear, deducting the weight of the wheel landing gear.

The rigid forward spreader permits the use of a light pin-joined streamline tube at the rear, which need not be designed for bending stresses, and because of its small section materially reduced the water friction from spray under take-off conditions. Furthermore, the wing section on the forward spreader tends to offset the slight nose-heavy couple generally

produced by a normal float installation and appreciably increases the take-off efficiency of the machine. The wing section also straightens out the airflow in its immediate vicinity and tends to carry the spray to the rear, an effect which has been found to be quite pronounced under certain conditions in spite of the fact that the wing is considerably aft of the propeller.

The automatic rudders, previously described in Aero Digest, are attached tothe transom of the float with a horizontal as well as a vertical hinge and connected. to the main air rudder controls through. the use of springs. They lie well below the bottom of the floats when in the air or when taxving on the water at speeds low enough to require their use, but automatically rise out of the water when higher speeds are reached. This feature of automatic reefing provides a safeguard against over-control at landing or take-off speeds, while the hinge at the same time permits them to ride up over obstacles or while backing in on a sloping runway or beach. The rudders greatly increase the maneuverability of the ship on the water and this effect has been found in the past to be particularly desirable on the low-wing monoplane types.

A standard model 6075 float installation complete with all attachments for a Lockheed Sirius weighs approximately 725 pounds including water rudders, mooring rings and anchor compartment, and adds approximately 385 pounds to the plane, deducting the weight of the wheel landing gear and tail skid.

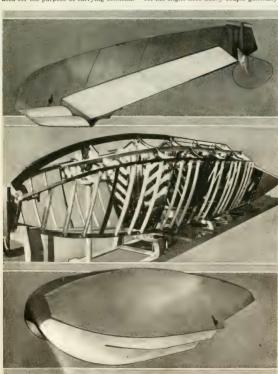
Specifications of Edo Model Y-6075

Length overall (without

rudder) 22 feet 3 inches Height overall. 3 feet 3 inches Width of each float. 3 feet 0 inches Tread of floats. 9 feet 7 inches Displacement, each float . 6075 pounds Weight of floats. 570 pounds Weight of attachment struts 242 pounds

Another important feature of the plane is the Wright Cyclone engine with which it is powered. Normally rated at 575 horsepower, the particular powerplant to be used has been stepped up to deliver 680 horsepower at 2,100 revolutions per minute. This increase has been accomplished by the use of a supercharger and enlarged cylinders. In most other respects the engine is the standard Cyclone model, a nine-cylinder radial air-cooled type. The cylinder barrels are of steel with integral fins screwed and shrunk into aluminum alloy heads. The valve seats are of aluminum, bronze inserted in the head with 75 degrees including angle between. The exhaust valve guide is of steel and the inlet valve guide of bronze, both shrunk into the cylinder

(Continued on following page)



Metal floats, as used for Lindbergh's Lockheed, under construction at the Edo factory

## yclone" Engine d Piston Rings

May, 1927, Whirlwind" les for thoured "Sirius" Mrs. Linda Wright—

Hammered gh's famous years later of achieveght engines worthy of

the names with which it is accordance.

A pleasant flight, Colonel!

## U. S. HAMMERED PISTON RING CO.

PATERSON, NEW JERSEY

U. S. Special Aviation rings hold compression under abnormal heat, have no hammer marks or fractured metal and have a true circle, flat surface and uniform wall thickness. (Continued from preceding page)

head. The exhaust valves are salt-filled. The pistons are of aluminum alloy with four rings above and one below the gudgeon pin.

The master connecting rod is machined from one forging. A steel sleeve, lined with anti-friction metal, is pressed and pinned into big-end to form a bearing. The master and auxiliary rods are of I-section. The gudgeon pins float in little ends and in pistons.

The crankshaft is of the single-throw split type, to permit use of a solid big-end master rod. It runs in one plain journal (front), one roller bearing (rear) and one ball thrust bearing in the nose of the crankcase.

The crankcase is of the barrel type of heat-treated aluminum alloy casting. It incorporates a separate chain gear casing in front and an annular induction chamber at the rear. The front section supports the ball thrust face. The rear section carries auxiliary gears and mountings.

The valve gear is a two-row cam disc running concentric with the crankshaft, at one-eighth crankshaft speed, in the intermediate section of the crankcase. The valves are operated through roller tappets, enclosed push rods and enclosed overhead rocker gear.

One Stromberg NAY7A carburetor feeds the induction chamber, which contains a General Electric supercharger impeller geared to run at 10.5 times crankshaft speed.

Lubrication is by means of the normal dry sump system. A quadruplex oil pump unit, with three scavenger and one pressure unit (gear type) is used.

Ignition is by two Scintilla VAG-9D magnetos mounted on the rear crankcase cover and supplying front and rear spark plugs in each cylinder.

Drives and mountings are provided on the rear crankcase cover for fuel pump, starter, dynamo and tachometer drives.

## ABSOLUTE CEILING CHART FOR PLANES

THE derivation of a chart for estimating the absolute ceiling of an airplane is discussed in N.A.C.A. Report 368, by Walter S. Diehl. This chart may be used in conjunction with the usual curves of power required and power available as an accurate substitute for extended calculation, or it may be used in the estimation of absolute ceiling when power curves are not available.

Report 368 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D, C.

#### PRESSURE EFFECT IN THE GASEOUS EXPLO-SIVE REACTON

A STUDY of the gaseous explosive reaction, the source of power in gas engines, has been in progress at the Bureau of Standards for a number of years as one of the projects undertaken at the request

and with the support of the National Advisory Committee for Aeronautics. In N.A.C.A. Report, 372, by F. W. Stevens. the effect of pressure on the rate of propagation of the explosive reaction zone and on the rate of energy liberation during the progress of the reaction is considered from a physico-chemical standpoint. The extensive experimental data on which the report is based, are drawn from the explosive reaction of a large number of fuels, covering reaction orders from three to fifteen. During their reaction these fuels were subjected to wide ranges of pressure and of other physical conditions usually imposed on the reaction by its industrial applications.

As a result of these studies, there have been brought out a number of important fundamental characteristics of the explosive reaction indicating that the basal processes of the transformation are much simpler and correspond more closely to the general laws and principles of ordinary transformations than is usually supposed.

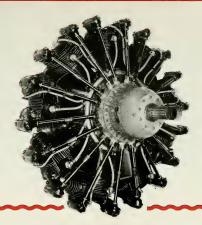
Report 372 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D. C.

#### PERFORMANCE OF SUPERCHARGERS

T HE comparative performance of superchargers is discussed in N. A. C. A. Report 384, by Oscar W. Schey. The comparison is presented on the basis of the power required to compress the air at a definite rate, and on the basis of the net engine power developed at altitudes from 0 to 40,000 feet. The investigation included geared centrifugal, turbine-driven centrifugal, Roots, and vane-type superchargers. A brief discussion of the mechanical limitations of each supercharger is included.

The results show that for critical altitudes below 20,000 feet there is a maximium difference of about six per cent between the amounts of net engine power developed by the various types of superchargers when ideal methods of control are employed; and for critical altitudes above 20,000 feet an engine develops considerably more power when equipped with a turbocentrifugal supercharger than with any other type.

JULY, 1931



# The "Cyclone" engine in Colonel Lindbergh's Lockheed is equipped with Breeze Radio Shielding

HEN Colonel and Mrs. Lindbergh take off for the Orient their Lockheed "Sirius" will carry the latest in radio receiving and transmitting apparatus. They will be able to maintain regular contact with ships at sea and along the coast and with stations in this and foreign countries, keeping a constant check on weather conditions and direction.

To eliminate interference from the ignition system Colonel Lindbergh's Wright "Cyclone" engine is equipped with Breeze Radio Shielding. Breeze Shielding is the conduit type which eliminates radio interference and protects the ignition cable from wear, tear and breakage due to exposure and makes it impervious to liquids, including oil, water, gasoline, kerosene, etc. This is especially important in seaplane flying, where spray might cause ignition trouble or affect radio communication.

Breeze Radio Shielding is the only complete shield.

Breeze Radio Shielding represents considerable research and experimental work, involving long study of the aircraft in-



dustry's problems. Particular attention was given to sturdy construction and quick servicing. Breeze Shielding has been thoroughly tested by aircraft and engine manufacturers and airline operators, Among those prominent in the industry who are using this shielding at the present time are Wright, Pratt & Whitney, Lycoming, Ford, Bellanca, Sikorsky, Stinson, N.A.T., Northwest Airways, Century Airlines and others

We are proud of the fact that Colonel Lindbergh is using Breeze Radio Shielding as a part

using Breeze Radio Shielding as a part of his important equipment. This we consider the finest recommendation to others who use, or contemplate the use of, radio in their flying operations.



U. S. and Foreign Patent Applications Pending

Each Breeze Radio Shield is designed for a particular make of engine. A table of weights for the different engines will be sent promptly to interested parties.

Consult our Engineering Department on all your Shielding and Bonding Problems

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Contractors to the United States Army and Navy

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## DIGEST of CURRENT TECHNICAL PAPERS

#### ENGINE METALS

Engineering Requirements in the Automotive Industry for Metals Operating at High Temperatures, A. L. Boegehold and T. B. Johnson. A. S. T. M. Symposium, Preprint.

PhART I of this paper deals with automobide and Diesel engines and discusses the properties required in metals used for pistons, valves, valve springs, cylinders and bearings. The good and bad properties of cast-iron, aluminum alloys and magnesiumbase and other light alloys for pistons are taken up in detail.

Part II is devoted to aviation engines and is written by the Chief of the Materiel Section of the Materiel Division of the Air Corps. Tables give the maximum temperatures for various materials used in high-performance engines and the properties of materials operating at elevated temperatures in aircraft engines. The author deals principally with cylinders, pistons, valve seats, valves, valve guides, exhaust piping, supercharger turbine buckets, and main and connectine-rod bearings.

The requirements for a satisfactory valve, not requiring lubrication or internal cooling, are listed as follows: The physical properties at room temperature shall not be affected by repeated heating to 1,600 degrees Fahrenheit and cooling in air. The material shall not warp or become brittle at any temperature between room temperature and 1,600 degrees Fahrenheit. The tensile strength at 1,600 degrees Fahrenheit shall not be less than 25,000 pounds per square inch. tip hardness at room temperature shall not be less than 75 degrees scleroscope. The stem and head hardness at room temperature shall not be less than 52 Rockwell hardness, "C" scale. The Izod impact value at room temperature shall not be less than 10 and between 1,000 and 1,600 degrees Fahrenheit shall not be less than 25 foot pounds. The steel shall not corrode in the air or in the presence of exhaust gases or condensed combustion products formed by gasoline containing 10 cubic centimeter per gallon of tetraethyl lead ethyl-dibromide at any temperature below 1,600 degrees Faherenheit.

#### ALUMINUM AND MAGNESIUM ALLOYS

The Mechanical Properties of Aluminum and Magnesium Alloys at Elevated Temperatures, R. L. Templin and D. A. Paul. A. S. T. M. Symposium, Preprint.

THE more recent and representative test data secured from short- and long-time tests of aluminum and magnesium alloys at different temperatures are discussed by the Chief Engineer of Tests and the Research Engineer of the Aluminum Company of America. Specific examples of the changes produced by different methods of manufacture, change of composition and thermal treatment are given. In taking up tensile properties of aluminum alloys at temperatures below normal, the author states that at such temperatures both strength and ductility of aluminum alloys seem higher than at ordinary temperatures. He points out that all

#### By Elsa Gardner

Abstracts of papers presented during the Annual Meeting of the Oil and Gas Power Division of the American Society of Mechanical Engineers, June 23 to 28, at the University of Wisconsin, during the Summer Meeting of the Society of Automotive Engineers, June 11 and dar White Sulphur Journal Meeting of the American Society of Testing Materials, June 22 to 28, at Chicago, including the Symposium on the Effect of Temperature on the Properties of Metals held with the American Society of Mechanical Engineers. The papers selected for reviewing are those of interest to designers and manufacturers of aircraft engineers and manufacturers of aircraft engineers.

metals commonly alloyed with aluminum increase its strength at elevated temperatures. In comparing wrought aluminum alloys with cast alloys, the author considers that the former are affected by temperatures in about the same manner as the cast alloys, but that wrought alloys are more susceptible to the changes produced by the high temperatures.

#### WIRE TESTS

Fatigue Testing of Wire, S. M. Shelton. A. S. T. M. Preprint.

THE result of tests of high-carbon, heat-treated galvanized steel wire, of the same wire with zinc coating removed, and of a low-carbon steel wire are discussed by the Junior Metallurgist of the U.S. Bureau of Standards. The endurance limits determined from test coupons with machined surfaces out from a structural member cannot be relied upon as the true fatigue limit of the structural member. A method is described for the determination of the fatigue limit of wire in its structural shape and condition. The specimens used were long enough to obtain sufficient increase in fibre stress in the medial transverse plane of the specimen without reducing its cross-sectional area.

It was concluded that a galvanized coating had a deleterious effect on the apparent fatigue limit of a high-carbon heat-treated steel wire. The endurance limit of a low-carbon steel was appreciably higher than the fatigue limit of a wire made from the same material. The author considers that the possibility of using the method for fatigue testing of other structural shapes such as pipes and tubes deserves further investigation.

#### WELD TESTS

Fatigue Tests of Weld Metal. R. E. Peterson and C. H. Jennings. A. S. T. M. Preprint.

RATIGUE test data are given on weld metal proper, covering the effects or machining, annealing, and peening. A particular feature of this investigation is the development of a rough (not machined) weld metal fatigue test specimen. It is hoped that from the data indicated, the analysis of design of Joint proposed for dynamically

stressed weld-fabricated structures can be performed logically in all cases.

It was concluded that for a one-inch diameter weld-metal specimen, hand welded, the direction of deposition of weld metal did not have a large effect on fatigue strength Rough (not machined) weld metal had a higher endurance limit than machined and polished weld metal. Annealing at 1,000 degrees Fahrenheit did not greatly change the fatigue strength of rough weld metal. Annealing at 1,700 degrees Fahrenheit resulted in a coarser grain structure and a lower fatigue strength of rough weld metal. Annealing at 1,700 degrees Fahrenheit resulted in a coarser grain structure and a lower fatigue strength of rough weld metal; peening the outer layer only was as effective as peening each layer successively:

#### LOW TEMPERATURE EFFECT ON METALS

Effect of Low Temperatures on Metals and Alloys, H. W. Russell. A. S. T. M. Symposium

A VAILABLE information on the properties of metals and alloys when subjected to a low temperature such as those sometimes encountered in aircraft service in summarized. In addition to mechanical properties at low temperature, other properties more in the domain of pure physics are included. Iron, carbon-steel, nickel-steel, nickel-chromium, iron-nickel, cobalt, copper, brass, nickel-brass, aluminum, duralumin, and magnesium alloys were tested.

Impact values at low temperatures received a relatively large amount of attention and the tables given deal with Guillery impact resistance and hardness, and Charpy impact resistance of some steels and magnesium alloys. Tables also cover chemical analysis of material, treatment of materials, tension test results, Brinnel hardness tests, fatigue tests at low temperatures, low-temperature properties of cast iron, variation of modulus of rigidity with temperature, volume compressibility of some metallic elements, coefficients of thermal expansion for pure metals, and mean coefficients of thermal expansion of alloys.

It is concluded that with decrease of temperature, in general, the yield point, tensile strength, hardness, endurance limit, modulus of elasticity, thermal conductivity, and electrical conductivity increased while the clongation, reduction of area, impact resistance, compressibility, thermal expansion and specific heat decreased.

OIL ENGINE SPRAY DISPERSION
Dispersion of Sprays in Solid-Injection Oil Engines, K. J. DeJuhasz. A. S. M. E. Preprint.

THE results of experiments made at the Engineering Experiment Station, Pennsylvania State College, of which the author is an assistant professor, are described. The purpose of one experiment was to determine whether atomization was due to the friction of jet with the air, while another was made to find out whether the oil particles, during their passage through the nozzle, became charged with static electricity owing to friction, which might have contributed to their too.

(Continued on following page)

TULY, 1931



# THE HOLF IN THE FOG

ADVERSE weather may suddenly overtake the airplane thus obscuring the natural horizon. Under these conditions, determination of the plane's attitude from interpretation of the usual instruments becomes extremely difficult. Loss of control may result.

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(Continued from preceding page)
dispersion as a consequence of electric re-

Details of the tests and equipment employed in the general research being carried out at the Station on the dependence of spray properties on the various governing factors are discussed. A means for deriving the percentage of spray passing through a precombustion chamber aperture, and the theoretical boundary of burning from the spray charts is shown.

The conclusion reached from the results of the tests were as follows: The dispersion became more, even when the injection pressure was increased, when the oil viscosity was decreased, and when the air density was increased. The cone angle increased with increasing oil pressure, increasing air density, and decreasing viscosity of oil. A larger percentage of oil reached a given distance in a spray having a slenderer spray cone. The author considers that the experimental method described and the procedure of evaluation developed are easy to apply, and that the results give a ready means of judging the spray from the point of view of its applicability in an engine. It is recommended as a useful tool in development work on oil-injection engines.

#### L-HEAD DIESEL ENGINE

Development of a High-Speed L-Head Diesel Engine, M. Hofmann, A. S. M. E. Preprinte. Engine developed by the Waukesha Motor Company is discussed by the Chief Diesel Engineer of that company. The author states that Diesel designers have called it an impossibility to make an L-head combustion chamber of the Diesel type with its high compression ratio necessary for compression ratio necessary for compression ignition, without unduly restricting the volumetric efficiency. Evidence is submitted in this paper to prove that it is quite possible to design such a combustion chamber with a compression ratio of about 14 to 1, and a volumetric efficiency equal to that of an

average L-head gasoline engine.

Among the advantages over the overheadvalve, are included: simplified valve-gear and head construction, reduction in height, high degree of turbulence, and lower excess air coefficient. The importance of the effects of turbulence during the exhaust stroke is emphasized. Another novel feature of the Waukesha L-head Diesel, is that fact that it can be started and operated as a gasoline engine with about one-fifth of its normal Diesel power output. After the Diesel is started on the Otto cycle, fuel oil is automatically pumped through the whole injection system at atmospheric pressure, ejecting any air present in the fuel lines before the motor is shifted to Diesel operation.

#### ENGINE VALVES

Experiments on the Flow of Air Through Engine Valves, E. S. Dennison, T. C. Kuchler, D. W. Smith. A. S. M. E. Preprint.

THE resistance of air flow through poppet valves was tested by the authors who are, respectively, the Section Engineer of the Four-Cycle Oil-Engine Section of the Westinghouse Electric and Mauríacturing Company, and engineers of the Oil-Engine

Division of that company. The experiments which they describe include flow in both intended to the the describe include flow in both intended to opening and of pressure head extend to or beyond the limits utilized in practice. Individual valves were tested variously mounted, and pairs of valves were tested as grouped in an actual design. The experiments have been extended in an effort to improve the flow characteristics of the poppet valve by modification of its shape and that of the valve approaches.

The authors draw the following conclusion: Inlet valves of conventional types perform in engine assembly approximately as they do in model tests. The results of Tanaka and those of the present experiments are suitable for design purposes. Exhaust valve tests on models are misleading unless the possible extent of diffuser action is known and understood, and such action should be eliminated or made to correspond to actual engine conditions. Improvement in valves may be effected by designing the flow path as a diffuser. This may be done locally at the valve head or seat, or in the passage above the valve, or in both ways. Preferably both methods should be combined in the exhaust valve and passage design.

#### DOUBLE-ACTING DIESEL ENGINE

Development of the Double-Acting Engine, L. R. Ford. A. S. M. E. Preprint.

WHILE this paper deals with the development of the Diesel double-acting engine for large power-plant work, it was thought that on account of the difficulties encountered in double-acting engine design, especially in the two-cycle types, it might be worth while to those interested in the design of double-acting two-cycle high-speed Diesei engines. Design features of the Burmeister and Wain double-acting two-cycle 18,500b.hp. engine, and the Worthington, Deutsche-Werke, McIntosh and Seymour, M.A.N., A.E.G., Richardson-Westgarth, Earle, and Krupp engines are discussed. The author consideres that at present the two-cycle type has forged ahead of the four-cycle design for power-plant work.

#### COMBUSTION CHAMBERS FOR HEAVY OIL ENGINES

The Quiescent Combustion Chamber, J. A. Spanogle. A. S. M. E. Preprint.

THE material in the discussion reported was obtained from performance tests of a single-cylinder test unit with a combustion chamber that seemed best suited to operation without effective air flow. The work was done by the staff of the National Advisory Committee for Aeronautics at the Langley Memorial Aeronautical Laboratory in the course of the general program for investigation the possibilities and limitations of the compression-ignition fuel-injection engine as a source of power for air-craft.

The simplest type of combustion chamber is naturally the quiescent combustion chamber, and the simplest injection orifice is the round hole. These two forms were the basis of the investigation, and the main series of test were directed at the determination of a method for obtaining the optimum combination of these elements.

The two great factors in obtaining improved performances for a compression-ignition fuel-injection engine are the control of distribution and control of combustion. For the distribution of the fuel to the air in the quiescent combustion chamber by means of multiple-orifice injection nozzles, these tests gave a principle which might be followed in the design of nozzles and show some of the difficulties encountered. For the control of combustion, these tests gave indications of the possibilities for control of rate of pressure rise through the control of rate of combustion and showed that the rate of fuel injection is not particularly important in influencing the rate of combustion, and, therefore, the rate of pressure rise for high-speed operation.

ENGINE VALVES

Recent Developments in Poppet Valves, A. T. olwell. S. A. E. Preprint.

Colvent. S. A. E. Fripmin.

THE author, who is chief engineer of The author, who is chief engineer of which valve development has followed with a list of materials and a description of methods of cooling. He remarks that the point where the stem joins the head is the hottest part of the valve, and gives illustrations of a shield for this point and of a shroud to protect the end of the valve-stem guide. He compares salt and sodium cooling, and describes methods of sealing the coolant in place.

AIR-COOLED CYLINDER HEADS
Air-Cooled Cylinder-Head Design, R. Chilton.
S. A. E. Preprint.

THE requirements for good cooling of cylinder heads in air-cooled engines are discussed by the consulting engineer of Wright Aeronautical Corporation. The relation between head temperatures and power ratings is pointed out. In speaking of cowling, the author remarks upon the encouraging results obtained in initial experiments in conjuction with baffles aimed at forcing the air to wash the entire length and depth of every fin. Temperature reductions of 100 degrees Fahrenheit have been realized in tests by means of baffles on uncowled engines and further reductions are indicated from the increased velocities due to the spinner cowl. With complete baffles resraining the air flow to the finned periphery only, a J-6 engine was well-cooled through a 15inch-diameter entrance hole, which corresponds to a one-inch-wide exit annulus, giving an almost perfect streamline when the entrance is in the spinner ahead of the propeller.

The author also suggests tests to be made in connection with the research on air cooling initiated by the N.A.C.A. In discussing detonation, the author considers that the limit to possible power output is set by detonation, which, with a given fuel, depends upon the cylinder-head temperatures. He also suggests that as cylinder-head temperatures are the basic index of operating conditions of air-cooled engines, a head thermocouple instrument should be standard equipment on every airplane and pilots should be trained to respect head temperatures as much as they now do oil pressures and temperatures. Much higher ratings and cruising speed could then be used with assurance under all normal conditions.

# To the ARMY AIR CORPS Congratulations

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With equal pride and full realization of your accomplishment, we whose lives are devoted to aviation take this opportunity of offering our congratulations on the success of the 1931 Army Air Corps Exercises.

The executive, administrative and flying personnel and the ground organization showed a peak of efficiency, and the equipment a mechanical perfection, that mark significant progress since the World War.

With congress and the people of this country we rejoice in this fitting climax to the five-year army program of the aviation branch of our national defense.

#### FOKKER AIRCRAFT CORPORATION OF AMERICA

Division of General Aviation Corporation

GENERAL MOTORS BUILDING, NEW YORK

# KELLETT side-by-side

For over two years the Kellett Aircraft Corporation, affiliated with the Ludingtion group in Philadelphia, has been developing an Autogiro under the Cierva patents, to supply the modern demand for an aircraft that could be flown by almost any one and that would not require the use of an airprot for its operation.

The Kellett Autogiro, although designed and built by a group having long experience in the airplane industry, is not an airplane and is not intended to replace the airplane, nor to compete with it on a speed-performance basis.

The present models are not designed for high speed flight, having a top speed of only 100 miles per hour, but their real utility lies in their ability to land with practically no forward speed, to fly slowly and at low altitude with security, and to operate out of fields not accessible to airplanes.

Although the K-2 has an excellent gliding angle, this is not of great importance. Its ability to descend vertically permits the operator to fly at high altitude to the very edge of his landing place, select the exact spot upon which he will land and glide down to it at a very steep angle if he so chooses, and to correct or alter that angle in conformance with weather conditions and to land deliberately with ample time for observation of all details.

Vertical landings are considered more or less as stunt or emergency landings. Normal Autogiro landing involves gliding to the earth at an angle of about 45 degrees, followed by the use of the rotor system as an air brake to reduce speed

to approximately ten or twelve miles per hour so that the use of brakes in landing at this speed brings the craft to a stop usually in about its own length. The speeds mentioned here refer to speed in still air, so that it can be seen that one can make a normal landing, for instance, against a ten-mile wind, with no forward speed relative to the ground.

The K-2 is a two-seater, where the passenger and driver sit side by side as in an automobile. A dual control system simplifies flying instructions in this ship. The cockpit of the Autogiro is about as wide as the front seat of the average automobile. It is so cowled in that one is well-protected from the wind and conversation can be carried on.

Although the Kellett Autogiro follows very closely the fundamental Cierva theory, the result of much development work is seen in many items of the structure. For instance, the undercarriage and fixed wings are supported entirely by steel struts, without the use of any external wires. Also the wheels are set twelve feet apart and are provided with long travel oleo shock absorber struts, which cushion the landing forces so that even vertical landings may be made.

#### Fuselage

The fuselage frame of the Kellett K-2 is built entirely of chrome-molybdenum steel tubing welded together as a unit. Although this fuselage resembles a conventional airplane fuselage, on close inspection it is found to differ quite radically, for the loading of an Autogiro fuselage in flight, as well as in landing

AUTOGIRO conditions, is quite different from that

of an airplane.

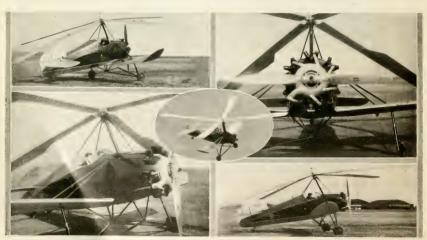
A triangular structure projects from the lower part of the fuselage to carry the hinge points of the very wide tread undercarriage. This structure also gives a very stiff fuselage in spite of the wide cockpit. In making vertical landings it is obviously essential that the shock absorber action of the wheels be vertical, for if the wheels were to spread as in an airplane the side loading on the tires would be too great. This low hinge point on the Kellett Autogiro permits the use of a tubular strut construction throughout without wires and stays.

#### Fixed Wing

The fixed wing of the K-2 is of larger dimension than ordinarily seen on Autogiros, though it follows very closely the fundamental Cierva Autogiro theory. In taking a certain portion of the total load of the craft in the high speed condition, this wing serves as a controlling factor in the operation of the rotor system.

There must be a nice degree of relationship between this fixed wing and the rotor system, for it can be seen that at extremely slow speeds, or in vertical descent, with no forward speed, the roton is carrying all of the load, but as the speed of forward motion increases, the fixed wing carries an increasing portion of the load, thus permitting the rotor speed to remain constant at all times.

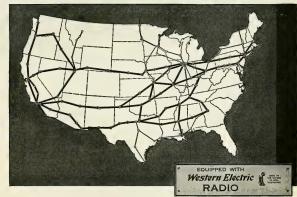
The wing of the K-2 is built up of box spars with wood ribs, fabric covered. The upturned wing tips provide excellent (Continued on following page)



The Continental-engine-powered Kellett Autogiro, showing side-by-side seating arrangement



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(Continued from preceding page)

lateral stability and automatically bank the ship at the proper angle when the rudder is used, making the operation of the ailerons practically unnecessary except for corrections of rough air conditions. In fact, the chief utility of the ailerons is usually at extremely low forward speeds. It is impossible to get a prolonged sideslip in the K-2. The ailerons are the Frise type and are operated by push-pull rods.

#### Rotor System

Each rotor blade (or rotating wing) is built around a tubular spar of large diameter chrome-molybdenum seamless steel tube heat treated to 180,000 pounds tensile strength per square inch. The symmetrical airfoil section is maintained by the use of approximately fifty plywood ribs, each of which is riveted to a chromemolybdenum steel collar, which in turn is pinned to the spar. This collar fits the tube so tightly that a special tool is used to put the collar on. The leading edge is formed of plywood and the blade completely covered with fabric. The trailing edge is of stainless steel. An interesting K-2 device is the means whereby the rotor clutch is automatically disengaged immediately before take-off.

The K-2 rotor pylon is unique in Autorio design, in that the large diameter front member carries all of the starting and braking torque and most of the lift but no side load. It has been designed for an ample factor of safety for such loads and is hinged and pinned at its lower end to a fuselage structure built for that purpose. The Kellett pylon is a completely pin-ended structure so designed that the stresses and loads are distributed between the individual members in such a way that each carries a certain share of the stress and is prevented from overload.

#### Landing Gear

The landing gear has a tread 12 feet wide and the oleo struts have ten inches of action. This long travel oleo combined with the use of 10-inch low-pressure tires absorbs all shocks of landing. Incidentally, it is extremely difficult to bounce an Autogiro on landing. This is due to the fact that the Autogiro rotor has considerable lift at the time of contact with the ground. At the moment of contact, the load is taken from the rotor, which then flattens out and materially reduces its angle of incidence. Even when the Autogiro is making a vertical or almost vertical landing, the weight of the ship is transferred slowly from the rotor system to the undercarriage.

The pneumatic-tired roller-bearing tail wheel is also equipped with a long travel oleo strut, so that when tail-first landings are made, there is no tendency for the tail to bounce and all landing shocks are taken up before reaching the fuse-lage.

#### Controls

Control is by conventional stick and rudder pedal system, the Frise ailerons being operated by push-pull rods and the elevator and rudder by direct cables. At the left of the cockpit are found two interlocking levers, one of which controls the rotor clutch and the other the rotor brake. Throttle is on the instrument board. Rudder pedals operate the wheel brakes either together or independently. A crank in the center of the cockpit is used for equalizing the loads on the elevator, for although practically all the variable loading in the K-2 is carried close to the center of gravity, some adjustment is necessary to maintain perfect trim. This is done by spring loading the elevator. Possible failure of the spring in no way impairs the proper functioning of the elevator control.

Standard instruments as follows are included: Compass, air speed indicator, altimeter, motor tachometer, rotor tacho-

meter, oil pressure and temperature gauges. Heywood air starter for the motor and engine-drive clutch starter for the rotor are provided; 6.50 by 10 tires with brakes are on the undercarriage wheels and a 10-inch by 3-inch pneumatic tire is on the tail wheel.

#### Tail Surfaces

The vertical fin, rudder, elevator and stabilizer are all of thick section streamline form and the horizontal surfaces are of high aspect ratio. It will be noted that the stabilizer does not have great area due to the fact that the rotor system in an Autogiro serves to a very great extent as a stabilizer in all directions. This is due to the fact that the Autogiro has very high inherent stability which actually increases as the forward speed decreases. The fixed stabilizer serves far more to increase the efficiency of the elevators as control surfaces than as a stabilizing surface.



#### NICHOLSON JUNIOR MONOPLANE

HE Nicholson Junior Model KN-2 is a two-place, side-by-side, open-cockpit, single-engined monoplane provided with folding wings and landing gear interchangeable with seaplane floats. Both the Szekely SR-3 L and the Continental A-40 powerplant were used in this ship with satisfactory results during more than 200 hours of flight testing.

The Clark Y airfoil section is used. The framework of the wings is built of laminated spruce spars and Aircraft Products Hyblum ribs, covered with fabric. Steel tubular drag struts and swaged rods for internal drag bracing are used. The leading edge of the wings is covered with a special waterproof fiber. The fuselage is constructed of SAE 4130 chrome-molybdenum tubing covered with abric. Modified Warren truss is used.

The landing gear is built of welded and bolted SAE 4130 tubing and is provided with semi-oleo shock absorbing struts. Goodyear Airwheels are standard equipment. The allerons are low aspect-ratio Frise type, constructed of spruce spars and stamped ribs of duralumin, covered with fabric. The landing gear attachment fittings are drop forged and standardized. All other fittings are stamped sheet SAE 1025 and 4130. All wearing parts are bronze bushed and replaceable.

Dual controls are provided as standard

equipment. The ship is wired throughout for navigation lights and provision is made for attaching them. Standard instruments include oil temperature gauge, oil pressure gauge, tachometer, air speed indicator and altimeter.

Flight characteristics of this ship, according to officials of the company, include hands-off recovery in one turn from ten-turn spin with power on or off; landing angle at any altitude with power off, held in this position until contact with the ground is made with a normal landing as the result.

#### Specifications

Specifications			
Span			
Length overall			
Wing area190 square feet			
Ailerons			
Dihedral1.5 degrees			
Sweepback			
Chord			
Weight empty540 pounds			
Disposable load			
Gross weight980 pounds			
Wing loading 5.15 pounds per square foot			
Power loading 21.77 pounds per horsepower			
Gasoline capacity			
Oil capacity			
Gasoline consumption2.6 gallons per hour			
High speed85 miles per hour			
Cruising speed75 miles per hour			
Landing speed28 miles per hour			
Take-off8 seconds			
Climb (first minute)650 feet			
Service ceiling			
Gliding angle12 to 1			
Cruising radius			

JULY, 1931

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#### RECENT PATENTS

THE following patents of interest to readers of this journal recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, 1343 H Street, N.W., Washington D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

Method and means for utilizing hydrogen in aircraft. Charles L. Stokes, Los Angeles, Calif. (1,802,586).

Propeller. Spencer Heath, Elkridge, Md., assignor to American Propeller Co., Baltimore, Md. (1,802,648).

Airplane - launching apparatus. Ernst Heinkel, Warnemunde, Germany (1,803,-649).

Landing-arriage for aircraft. Ernst Zindel, Dessau, Germany, assignor to Hugo Junkers, same place (1,802,692).

Plane for aircraft. Hugo Junkers, Dessau, Germany (1,802,721).

Brake for aircraft. Kurt Kollinek, Litchenberg, Berlin, Germany (1,802,724). Device for transferring aeroplane mail.

Lorin O. Miller, Dunkirk, Ind. (1,802,730).
Propeller. Florian De Narde, Cleveland,
Ohio (1,802,808).

Aeroplane. Daniel Morris, St. Petersburg, Fla. (1,802,825).

Bulkhead. Charles H. Roberts, Phoenix, Ariz., assignor to Roberts Aircraft Corporation (1.802.835).

Aeroplane control. Jimmy Terry, Chicago, III. (1,802,849).

Mechanical rocket power for airplanes. Karl M. E. Zwinkel, Hoboken, N. J., assignor to Tubular Air-Craft Corporation (1,802,860).

Mechanical rocket power for airplanes. Karl M. E. Zwinkel, Hoboken, N. J., assignor to Tubular Air-Craft Corporation (1,802,861).

Airship. Arvel M. Balch, Los Angeles, Calif. (1,802,863).

Supporting and propelling apparatus based on centrifugal power. Jean de Chappedelaine, Paris, France (1,802,882).

Airplane construction. Harold A. Hicks, Detroit, Mich., assignor to Ford Motor Co., Dearborn, Mich. (1,802,915).

Flying boat. Franz Wurth, New York, N. Y. (1,802,996).

Airship coach. Harry Castady, Chicago, III. (1.803.005).

Airplane-fuselage construction. Harold A. Hicks, Detroit, Mich., assignor to Ford Motor Co., Dearborn, Mich. (1,803,018).

Single-spar aircraft-wing. Willy Messerschmitt, Augsburg, Germany (1,803,030).

Aeroplane-chassis. Celestino Rosatelli, Turin, Italy (1,803,039).

Air-cooled condenser for steam-driven vehicles (aircraft). Rudolf Wagner, Hamburg, Germany (1,803,156).

Connection between the longitudinal and transverse bracing members in hollow bodies for aircraft. Willy Messerschmitt, Augsburg, Germany (1,802,438).

Apparatus for launching planes. Neals P. Christianson, Los Angeles, Calif. (No. 1.803,320.)

Airplane control. Roland Chilton, Keyport, N. J., assignor to Aeromarine Plane & Motor Co., same place. (No. 1,803,498.)

Take-off and landing platform for aeroplanes. Michael J. O'Neill, Chicago, Ill. (No. 1,803,507.)

Directional stabilizer for aircraft. Hervey M. Salisbury, Walnut Grove, and Arthur F. Miller, Sacramento, Calif. (No. 1,803,-655.)

655.)
Aeroplane. Edward H. Lanier, Covington, Ky. (No. 1,803,805.)

Adjustable propeller. John W. Mac-Clatcher, Compton, Calif. (No. 1,803,858.) Parachute. Albert C. Jenezon, Baltimore, Md. (No. 1,803,903.)

Wing construction for aeroplanes. William R. Parmele, Portland, Ore. (No. 1,803,915.)

Automatic airplane-control mechanism. Frazer W. Gay, Newark, N. J. (No. 1,804,-006,)

Propeller. Joseph Koenig, Mantowoc, Wis. (No. 1,804,016.)

Airplane. Jacques Eck, Los Angeles,

Calif. (No. 1,804,092.)
Safety device for aeroplanes. Mikulas
Drbul. Chicago, Ill. (No. 1,804,156.)

Method and apparatus for increasing the life of airplanes. Trian Berbeck, Baltimore, Md. (No. 1.804.307.)

Aircraft motor and mounting. Charley L Brown, Rushville, Mo. (No. 1,804,311.) Aircraft motor and mounting. Charley L. Brown, Rushville, Mo. (No. 1,804,312.)

Safety lighting and descending accessory for aircraft. Thomas M. Leka, Englewood, N. J. (No. 1,804,352.)

Aeronautical propeller. Sylvanus A. Reed, New York, N. Y., assignor to Reed Propeller Co., same place. (No. 1,804,433.)

Aeronautical propeller and method of making the same. Sylvanus A. Reed, New York, N. Y., assignor to Reed Propeller Co., same place. (No. 1,804,434.)

Concentric hinge connection for airplanecontrol surfaces. Bayard S. Stewart, Hazletcn, Pa., assignor of four-fifths to General Aircraft Corporation, same place. (No. 1,804,520.)

Aeroplane landing light. Earl Van Horn, Los Angeles, Calif., assignor to Goodyear's, Inc. sympology (No. 1804 572)

Inc., same place. (No. 1,804,572.)

Airship. Clinton D. Bowker, Phoenix,

Ariz. (No. 1,804,588.)
Aircraft. Joseph M. Gwinn, Jr., Buffalo,
N. Y., assignor to Consolidated Aircraft
Corporation, same place. (No. 1,804,765.)

Aircraft. Isaac M. Laddon, Buffalo, N Y., assignor to Consolidated Aircraft Corporation, same place. (No. 1,804,790.) Landing-gear for aeroplanes. Joseph

Silverman, Chicago, Ill. (Nó. 1,804,817.)
Aeroplane-wing. Walter M. Cross, Kan-

sas City, Mo. (No. 1,804,824.)

Flying machine. Benjamin Gambarini, Alameda, Calif. (No. 1,804,869.)

Method of balancing propeller-blades. Arvid Nelson, Milwaukee, Wis., assignor to Hamilton Standard Propeller Corporation, West Homestead, Pa. (No. 1,805,149.)

Aircraft fitting. Andrew J. Fairbanks, Dayton, Ohio, assignor to Consolidated Aircraft Corporation, Buffalo, N. Y. (No. 1,805,439.)

Airplane. Cornelius Ramakers and David R. Carsley, Los Angeles, Calif., assignors to Soaring Plane Corporation. (No. 1,805,722.)

Automatically-controlled airplane. Robert M. Adamson, Los Angeles, Calif. (No. 1,805,750.)

Aeroplane. Earl R. Kelly, Kansas City, Kans. (No. 1,805,770.)

Glider propulsion device. Gustav A. Miller, Seattle, Wash. (No. 1,805,834.)

Parachute. Joseph J. Wampach, St. Paul, Minn. (No. 1,805,894.) Landing-skid for aeroplanes. Alf N. Lar-

Landing-skid for aeroplanes. Alf N. Larsen, Ogden, Utah. (No. 1,805,914.)

Aeroplane. William Niemeyer, Sheridan, Tex. (No. 1,805,994.) Method of bracing a cantilever beam

against torsional deflection (in aircraftwings). David L. H. Williams, Ickenham, England. (No. 1,806,010.)

Airship. Willis C. Ward, Orchard Lake, Mich. No. 1,806,135.)

Safety wing for aircraft. Berent O. Dahl, Viroqua, Wis. No. 1,806,148.)

Altimetric automatic controlling device for carburetors for aeroplane-motors. Antonin Boulade, Lyon, France. (No. 1,806,280.) Aircraft. Russell Thayer, Philadelphia, Pa. (No. 1,806,316.)

Adjustable and reversible propeller for aeroplanes and other aircraft. Roy F. Wooden, Mount Vernon, Ill. (No. 1,806,-325.)

Adjustable cover for cockpits. Joel L. Pivak, New York, N. Y. (No. 1,806,366.)

Wings and other aerofoils of aircraft. Ronald McK. Wood, South Farnborough, England, assignor to Handley Page, Ltd., Cricklewood, England. (No. 1,806,375.)

Variable-pitch propeller. Mogens L. Branson, Hendon, London, England. (No. 1.806.385.)

Safety appliance for airplanes. Thomas B Lyles, Terre Haute, Ind. (No. 1,806,-403.)

Airplane-control mechanism. Ralph H. Upson, Red Bank, N. J. (No. 1,806,432.) Gas-container for aircraft. Victor Kopikowski, Philadelphia, Pa. (No. 1,806,470.) Retrieving device for aeroplanes. Jacob H. Wallace, San Diego, Calif. (No. 1,806.

549.)
Aeroplane. William W. Christmas, New York, N. Y., assignor to General Development Co., Hartford, Conn. (No. 1,806,586.)

ment Co., Hartford, Conn. (No. 1,800,586.) Ariplane. Henry M. Salisbury, Walnut Grove, and Arthur E. Miller, Sacremento, Calif. (No. 1,806,648.)

Mooring-mast. Philip C. Traver, Lynbrook, N. Y., assignor to Jamaica Sea Airport, Jamaica, N. Y. (No. 1,806,655.)

# IN 115 YARDS IT TAKES OFF! IN AN HOUR IT FLIES 115 MILES!





To pilot yourself for the sport of flying with one or two friends-or for use commercially on short hops and taxi trips-here's a smart craft you'll be proud to own ... Curtiss-Wright's brilliant new biplane the Travel-Air LIGHT SPORT! ● It has all the speed and power you want for fun. It has all the stamina and sturdiness you need for commercial operations. • In 115 yards it takes off. In an hour it flies 115 miles. It climbs 850 feet a minute-banks, turns as nimbly as a bird-and cruises smoothly for 400 miles in a morning's jaunt. • Its Kinner engine of 125 h.p. gives you power aplenty for the sport trips you take, and its endurance stands the gaff of sight-seeing and taxi-work you put it to. The LIGHT SPORT is sturdily built. Its rigging, bracing, frame-work, and surfacing-from wing to wing and nose to tail-is over-strengthened to stand the hardest kind of usage. • And Curtiss-Wright's engineers have taken good care in designing the LIGHT SPORT to keep each part

accessible, simple, and inexpensive to service. If you fly for fun you'll like the Kinner-powered LICHT SPORT. If you fly for profit you'll find it a dependable dollar-earner. • Let a Curtiss-Wright dealer demonstrate the LIGHT SPORT to you and you'll want to own it. And look over

SPORT to you and you'll want to own it. And look over the other planes that Curtiss-Wright builds. The 2-place JUNIOR—\$1490 . . . 2-place SPORT TRAINERS—\$3500 to \$4455 . . . 3-place SPORTSMAN—\$4995 to \$8750 . . . 4-place SEDANS—\$4595 to \$9600 . . . 6-place TRAVEL-AIR—\$12,435.

# CURTISS-WRIGHT

AIRPLANE COMPANY

ROBERTSON, MISSOURI

(A DIVISION OF CURTISS-WRIGHT CORPORATION)



## THE CONSOLIDATED TRAINER

THE Consolidated 21-A is a twoplace, open-cockpit, dual control, tandem biplane manufactured by the Consolidated Aircraft Corporation, Buffalo, N. Y. This ship is a convertible primary trainer, advanced trainer or observation plane. As a primary trainer, the following powerplants are optional: five-cylinder J-6 Wright; five-cylinder Kinner C-5; or seven-cylinder Continental. Each of these engines is rated at 175 horsepower. As an advanced trainer or observation plane, the following engines are suitable; Wasp Jr., 300; Wright J-6, 300; or Wasp, Jr. 400.

The framework of the wings is constructed of heat-treated duralumin ribs and laminated solid wood spars, covered with fabric. Fittings are of heat-treated chrome-molybdenum steel. The fuselage is of chrome-molybdenum welded steel tubing with detachable engine mount. The ailerons are constructed of heat-treated duralumin ribs and durahumin tubular spar, covered with fabric. Taper bolts are used at all wing hinge and interplane strut connections. All wing fitting at-

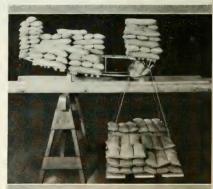
tachments to spars are through the medium of Bakelite bushings. A number of zippers have been provided to all important points on the wings and fuselage to facilitate inspection.

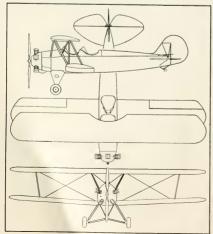
The framework of the landing gear is of chrome-molybdenum steel tubular construction. It is of the divided-axle type. Semi-balloon tires, oleo shock absorbers and brakes are provided. Tread is 84 inches. A tail skid and tail wheel are

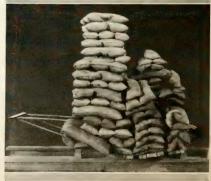
interchangeable. Both are mounted on long stroke rubber shock absorber rings and both are steerable. Tail skid and landing gear axles are mounted on ball bearings. The tail skid attachment to the fuselage is mounted in rubber to absorb ground loop shock. Dual brakes and parking brakes are provided. All moving parts in the brake control are mounted on ball bearings.

(Continued on following bage)

Static load tests of wing ribs. Upper view shows high incidence test (1360 pounds) and lower view shows low incidence test (1156 pounds). The drawing below shows the Consolidated Model 21-1 outlines







TULY. 1931





# ECONOMICAL

Maximum economy at part throttle or cruising speed has taken on a new meaning with the development of the Stromberg Aircraft Carburetor.

Two types of *Economizer Systems* contribute to this efficiency on Strombergs.

One is the *Needle Valve* type; the other, the *Piston* type. Both are operated by the throttle; both permit the carburetor to operate at maximum efficiency on a lean mixture at cruising speed and provide a rich, powerful mixture at full throttle.

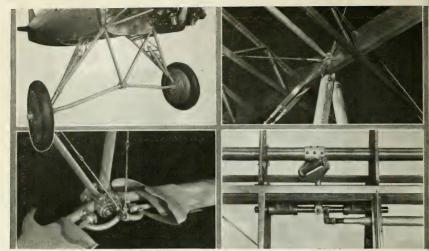
Economical cruising is one of many reasons why Stromberg carburetors are used on over 95% of the aircraft engines now being built in the United States. Stromberg engineers will gladly help you with your own carburetion problems. Inquiries are invited.

# STROMBERG CARBURETORS

BENDIX STROMBERG CARBURETOR COMPANY

SUBSIDIARY OF BENDIX AVIATION CORPORATION >

701 BENDIX DRIVE - SOUTH BEND, INDIANA



Details of the Consolidated model 21-A. Upper left—oleo kanding gear; right—rear beam lift wire fitting at wing strut; lower left—split axle joint, showing streamline covers and brake levers; right—aileron actuating mechanism

#### (Continued from preceding page)

Flight controls are ball bearing at every connection, including aileron, elevator and rudder hinges and at all clevis mast attaching points. The ball bearings used are of stainless steel and are sealed water-tight and dustproof, requiring but one lubrication during the life of the airplane. The rudder pedals are adjustable with a six-inch range.

The elevators and ailerons are operated by push and pull tubes. A special Consolidated operating mechanism is used in the ailerons to eliminate all exposed control parts and masts. The stabilizer is adjustable in flight from both cockpits by means of a bevel geared ball bearing control with non-jamming stop. Indicators visible to either pilot are provided on each stabilizer control. The fin is adjustable on the ground.

All engine controls are direct operating push and pull rods with bell cranks and walking beams. All cockpit installations are made in the fairing outside of the longerons to provide maximum clearance and roomy cockpits. The instruments are indirectly lighted and the instruments are indirectly lighted and the instruments is covered with sponge rubber crash pads of 1.5-inch thickness. A fire extinguisher is installed in a streamlined container partially outside of the fuselage. It may be reached from either cockpit or from the ground.

As a primary trainer, this ship is provided with a primer and starter engagement immediately inside the engine cowl door. A special telescopic starter extension rod is provided at the same place; it is pulled out for cranking and in flight it is completely enclosed within the cowl. The starting crank handle is stowed within the engine compartment.

A metal-lined baggage compartment of 4.5 cubic feet is installed aft of the rear cockpit.

An aluminum gasoline tank with a capacity of 43 gallons is enclosed in the center section and provided with a sight gauge and two outlets. Additional fuel may be carried in a 30-gallon tank in the fuselage under the cowl forward of the pilot. If desired, fuel may also be carried in a belly tank.

#### As Primary Trainer

Weight empty
Gross weight2,380 pounds
Wing area (including ailerons) 266 sq. feet
Span
Chord
Wing loading 8.96 pounds per sq. ft
Power loading (Kinner C-5

at 175 h.p.) . . . . . . . . . 13.6 pounds per h.p. High incidence safety factor on above

 gross load
 12

 Landing factor on above gross load
 8.15

 Airfoil
 N-22 modified

#### Performance

The following performance figures are based on actual performance tests made in accordance with Air Corps methods with Kinner C-5 developing 170 horsepower at 1,700 revolutions per minute; propeller of nine-foot diameter; and gross weight of 2,400 pounds (primary trainer):

 With the Kinner C-5 engine developing 200 horsepower at 1,900 revolutions per minute, propeller and gross weights as above, the reformance is as follows:

#### Flying Characteristics

There is slight positive longitudinal, directional and lateral stability at all speeds and throttle settings. All maneuvers were performed with moderate stick forces. Plane does not tend to spin when stalled either in level flight, in high bank turns or with abrupt use of controls. The ship spins easily when desired and recovers quickly. It recovers from spins with hands and feet off and can be brought out of spin on point.

#### Data

#### As Basic or Advanced Trainer

Weight empty (calculated) 1,870 pounds
Gross weight2,770 pounds
Gasoline capacity
Wing area (including ailerons)266 sq. feet
Span
Chord
Wing loading10.4 pounds per sq. ft.
Power loading (Wasp. Jr. 300)
9.24 pounds per h. n.

#### With a J-6 Wright of 300 horsepower

(Continued on following page)



Goodrich LOW
PRESSURE TIRES
permit easier—
safer landings—
smoother braking—
W. D. WATERMAN finds

This new Variable Wing Monoplane is said to be one of the smoothest flying ships yet developed. Air shocks are greatly reduced and the speed range increased fifteen miles per hour by merely changing its wing adjustment.

One of this plane's many advantages is Goodrich Low Pressure Tires. Of this equipment Mr. Waterman writes: "Their installation has improved the taxing qualities of the ship 100%. They have not given a minute's trouble and the ship now lands as if it were alighting on a feather bed. The brakes are exceedingly smooth in operation, holding firmly, but with no tendency whatsoever to grab.

"Goodrich Low Pressure Tires were installed at practically no increase in weight or sacrifice of flight performance."

Whether you manufacture planes or pilot them you provide the utmost for safe, easy take-offs and landings when



Mr. Waldo D. Waterman, designer of the Variable Wing Four Place Cabin Monoplane, tells why he is a strong booster of

Goodrich Low Pressure Tires.

you specify Goodrich Low Pressure Tires.

There is a Goodrich Low Pressure Tire that can be easily and quickly installed on any plane with or without brakes.

Phone your nearest Goodrich Distributor or write to the Aeronautical Sales Department of The B. F. Goodrich Rubber Company, Akron, Ohio.

# Goodrich Rubber for Airplanes

Another B. F. Goodrich Product



treamline Windshields · Tail Wheels · Hose Tubing
Engine Mounts · Crash Pads · Accessories

(Continued from preceding page)

ur a Wasp, Jr. of 300 horsepower, both at 2,000 revolutions per minute; propeller of 9-foot diameter; and a gross weight of 2,800 pounds (advanced trainer), the performance is as follows:

With a Wasp, Jr. of 400 horsepower at 2,300 revolutions per minute; propeller of 8-foot 10-inch diameter; and gross weight of 2,800 pounds (advanced trainer), the performance is as follows:

Gross weight (observation)...3,000 pounds
Rate of climb (sea level)....1,810 feet
Service ceiling....21,000 feet

#### Strength Characteristics

The factors of safety at the maximum probable gross weight of 3,000 pounds are as follows:

High incidence10
Low incidence 6
Inverted flight 4
Dive (at 275 m.p.h.)
Landing 7

#### RADIO SHIELDING

A RADIO shielding designed for all models of Pratt & Whitney aircraft engines to prevent the engine from interfering with radio communication on board a plane, has been developed by Walter A. Hamilton, vice president of the Aero Corporation of California.

The Hamilton shielding is constructed in two units. The method of shielding eliminates approximately twenty feet of standard wiring on the Wasp model. The longest exterior wire is seven inches in length.

With the exception of the wires leading from the main loom housing to the spark plugs, all parts are standard size and are interchangeable for the Wasp,



Side view of the Consolidated convertible trainer and observation plane

Wasp Junior, Hornet A and the Hornet B models.

Standard parts include: two main loom housings, eighteen spark plug wire units, two main conduits, two magneto shields and eighteen B. G. special shielded soark plugs.

The shielding does not interfere with standard cowling and can be installed without removing the engine from the plane.

IGNITION CABLE LACQUER
E. I. DUPONT DE NEMOURS &
COMPANY has developed a lacquer for airplane ignition cables which, it is claimed, will materially reduce one of the principal causes of engine trouble.

Working in collaboration with members of the technical staffs of cable manufacturers, du Pont scientists conducted research and experimentation to overcome engine trouble which is the result of failure of ignition cables through the destruction, of the rubber insulation by ozone caused by carona action. Carona action is an electrical phenomenon which may be seen in the dark as a purplish glow surrounding charged high-tension wires. The atmospheric condition due to carona action is similar to that during an electrical storm when lightning releases ozone.

The special lacquer is applied to the braid around the rubber which encases an ignition cable to insulate it. This treatment not only excludes ozone from the rubber, but also protects it from the destructive action of gasoline.



Consolidated trainer, Type 21-A, powered with Kinner C-5 engine

#### RADIO BEACON

A RADIO beacon and receiving system for blind landing of aircraft is described by H. Diamond and F. W. Dummore in a work issued as Research Paper, No. 238, by the Bureau of Standards. The booklet may be obtained from the Superintendent of Documents, Washington, D. C., at a cost of twenty-five cents.

A radio beacon and receiving system is described for use at airports to permit the blind landing of aircraft under conditions of no visibility. The system comprises three elements to indicate to the pilot the position of the aircraft as it approaches and reaches the instant of landing. Lateral position (that is, landing field runway direction) is given by a small directive beacon of the same type as employed for guidance on the airways, differing only in the use of the smaller loop antennae and lower power. Longitudinal position along the runway (that is, approach) is given by a marker beacon. Height is given by an inclined ultra-high-frequency radio beam, used in such a way as to provide a very convenient gliding path for the landing air-

The same medium-frequency receiving set required for obtaining radio telephone and radio range beacon service on the airways is utilized for receiving the runway localizing and marker beacon signals. The course indications of the runway localizing beacon are observed on the same vibrating reed indicator as employed on the main radio range beacon, automatic control of receiving set sensitivity being provided to maintain substantially constant reed deflections regardless of the distance between airplane and transmitting station. marker beacon indications are received aurally. A special high-frequency receiving set is required to receive the landing beam signals. The rectified output current of this set is passed through a D. C. microammeter mounted on the instrument board. By keeping the deflection of this microammeter at a fixed value, the pilot directs the airplane along the curved path coinciding with the line of equal intensity of received signal below the axis of the beam.



# Ground Safety is as important as Air Safety

Of what avail are the intricate instruments perfected by science for safety in air flight—if danger lurks in the airport?

Gilmore engineers have developed several methods of surfacing for takeoff runways and landing areas with the use of Gilmore Special Asphaltic Airport Oils, that provide the maximum of safety regardless of weather conditions. They are durable, impervious to water, unaffected by heat or cold. Let Gilmore Engineers solve your problems . . . Gilmore Oil Company, 2423 East 28th Street, Los Angeles, California.





## GERMAN TRANSPORT AIRPLANES

FTER the Great War Germany possessed a very efficient aircraft industry which, owing to the Treaty of Peace, faced a great problem. By the terms of the treaty the German armaments were cut down to a fraction of what they were before 1914 and the country was prohibited from maintaining any kind of military air force or producing any military aircraft. The German aircraft industry was allowed to manufacture only airplanes for sport and transport, and even these were for many years limited to a certain maximum size. Many factories closed down altogether. Some opened branch factories in neutral countries and there continued to produce machines prohibited in Germany. However, since the big nations naturally fostered their own industries, the market for their products was but small. The sole value of these foreign factories, therefore, was to enable the designers to continue gaining experience in the construction of military and, above all, of large aircraft and so to keep abreast of the development outside Germany.

The limitations prescribed by the treaty of peace proved beneficial, however, for the German industry consistently and determinedly turned its attention to the construction of civil transport planes at a time when the industries of the other great nations were still compromising between the production of military and civil aircraft. The need of the latter was recognized by the industries, but the governments would not at first support the production of purely civilian planes and required that the latter should be capable of immediate conversion into war aircraft in case of emergency-two opposing demands which the manufacturers had to fulfill as best they could. Hence, it came about that at least during the first half of the last decade German manufacturers produced the best all-round passenger and goods transport planes in the world, and today these are still in the foremost rank. In some aspects the German industry may still be said to be leading, as, for instance, in the design of large all-metal planes, in which the German industry is still doing pioneer work.

Today Germany has the following producers of transport planes: Junkers, Dornier, BFW (Bayerische Flugzeug-Werke), Focke-Wulf, Heinkel, Rohrbach, Arado and Albatros. Junkers specializes in the production of all-metal landplanes, while Dornier and Rohrbach are noted for their all-metal flying boats, though they also each produce a successful type of Jandplane. The other makers build chiefly smaller planes, employing metal, wood and fabric as materials. We shall pass the production of the various German makers in review and obtain an idea of the feature's peculiar to their maides of the feature's peculiar to their ma-

#### By Edwin P. A. Heinze

chines. Most of the German transport planes are distinctive designs. Inspired by the example of Junkers, who built his first all-metal machines during the war, the German industry early turned to the construction of all-metal planes, although with the exception of Rohrbach no factory has applied the all-metal principle to the same extent as Junkers. Most of the manufacturers employ fabric to cover, at least partially, the metal wing and fuselage structure. Some even still adhere to wood construction. A feature of all German transport planes is that they are of the monoplane type, mostly with strutless cantilever wings. The few models which still have the wings supported by struts are gradually being superseded by the cantilever type.

The Junkers Flugzeugbau company at Dessau is doubtless the most successful German maker of land aircraft, for no other Germany company has so many machines of its construction and design flying in every part of the world. For this reason we will consider first the planes produced by this manufacturer. The great popularity of Junkers planes, which are relatively expensive, is due not only to their aerodynamical qualities, but also to their durability and resistance to weather and exposure. Many machines have been in virtually continuous use for the past eleven years. For instance, one delivered in 1919 is still doing service on the Luft Hansa. The machines require no hangar and can be left standing out in the midst of winter or in the heat of the tropics, without impairment of flying qualities. These, of course, are assets inherent in every good all-metal plane, but Junkers' wide experience and his special constructional features give his planes unusual advantages.

The constructional features of Junkers machines are more or less the same in all models, as are also the general lavout and design, the one exception being the large G.38 plane. This plane, the fundamental features of which were patented as far back as 1910, approaches the ultimate aim of Professor Junkersthe all-wing plane. The Junkers range of transport planes still in production today comprises seven types, of which four are single-engined aircraft, two threeengined and the G.38 four-engined. The machines with one and three motors all have low-set wings built up in five or seven sections, the central of which is integral and forms the bottom of the fore part of the cabin structure. This lowwing arrangement has proved very efficacious in forced landings as the cabin is protected by the very strong central wing

section in the event of a crash. The wings taper toward the tips in plain contour and thickness and are built in a manner employed also in the G.38 machine. They have no spars of the conventional type, but have a number of seamless duralumin tubes running the length of the wing and distributed around the periphery of its section. At intervals the tubes are joined by rib structures, which serve mainly to locate the tubes, the wing deriving its strength from short, triangularly arranged, pressed struts of open channel section made of duralumin and riveted in place. The struts and tubes constitute an exceedingly strong girder frame structure, in which all pressures are distributed over a large area. Also, the skin of the wings has a definite statical task to fulfill. This skin consists of corrugated sheet duralumin, which is heat-treated and formed to the contours of the wing structure, to which it is riveted. The corrugations run in the direction of the chord and offer great resistance especially to torsional forces. The central section of the wing is integral with the cabin structure. The ends project from the sides of the fuselage and the tube ends correspond in their location with the ends of those in the wing sections to be fixed on the stub wings. The open tube ends are provided with steel muffs, which are riveted in place. These have spherical socket seats and a threaded collar integral with the muff. The muffs on the tubes of the wing sections to be attached are correspondingly formed to fit into the sockets and have a ring cap nut, which, upon being tightened on the thread, causes the tubes of the stub wing and the attached section to align until they are firmly seated. making a rigid joint.

As already indicated, the trimotored Junkers machines have the wings sub-divided in five or seven sections. Two of these have motor cradles on top of the leading edge. These intermediate wing sections are attached in same manner as just described.

The fuselage consists of a duralumin frame covered with corrugated sheet duralumin, the corrugations of which run the length of the body, reinforcing it. It is an interesting fact that Junkers all-metal machines are actually lighter than similarly large and powerful planes made of wood, although the latter material is specifically lighter than duralumin, which is an alloy consisting of 90 per cent of aluminum and 10 per cent of copper and manganese.

Turning now to the descriptions of individual models, it is, perhaps, advisable to start with the oldest model now being built, which is the prototype of the later models. It is called the F.13 type, and is one of the most successful transport planes ever built. Machines of this type have been in constant operations.

tion all over the world since 1919. As in all Junkers machines, the wings, beginning from the point of attachment to the stub wings or motor wing section, have a slight lateral dihedral angle. In the case of the F.13, the span is 58 feet and the supporting surface, including the ailerons, 430 square feet. The wings are built up of nine duralumin tubes inter-nally braced in the manner described, and they support a load of 10 pounds per square foot, as the plane fully loaded weighs 4,290 pounds. This is the weight of the machine when fitted with floats. With ordinary wheel landing gear it weighs 4,070 pounds and is able to transport a load including two pilots, four passengers (or one pilot and five passengers) and fuel totaling 1,540 pounds. In the case of the float machine, the fuel load may be 1,320 pounds. All Junkers machines can be supplied with floats.

The cabin has ample room for four comfortable arm chairs; access to it is obtained through side doors opening out on the stub wings. The fuselage is roughly rectangular in section. The total length of the plane is 31.5 feet; its height is 11.5 feet. The motor is installed as usual in the front end under a bonnet. Behind it is the cockpit, which is partially covered by an extension of the cabin roof. A characteristic appearance is given by a tongue curving down in the center with the end fastened to the forward edge of the cockpit, leaving a large oval opening at each side for the pilots to enter.

The control surfaces are operated in the usual manner by a control stick with steering wheel. The elevator and aileron connections consist of duralumin rods and levers; the rudder is operated by pedals and cables. The latter are conducted in a straight line within the fuse-lage beneath the cabin floor, the joints and lever bearings being accessible through small covered openings in the skin of the fuselage. The rudder fin is fixed on top of the tail end. Also the stabilizer is fixed, balancing being effected by a fuel tank situated just in

front of the tail skid inside the fuselage. The pilot has a pump lever within reach and is able to empty or fill the tank according to requirement. The skid has castor action and is sprung by rubber cord. The landing gear is of the splitaxle type, embodying two rubber cord shock absorbers on each side. It can readily be dismounted and exchanged for floats or snow runners.

Various types of motors with an output between 160 and 230 horsepower can be fitted, preference being given to a water-cooled BFW or Junkers with a respective output of 185 and 195 horsepower. Fuel is stored in two tanks mounted inside the stub wings, from where it is pumped by a motor-driven pump to a gravity tank under the roof of the cockpit. The working of the fuel pump is controllable through an inspection glass in front of the pilot and in the event of a failure fuel can be pumped by hand. Several filters are incorporated in the fuel line between gravity tank and

(Continued on following page)









Junkers G.24 trimotor

(Continued from preceding page)

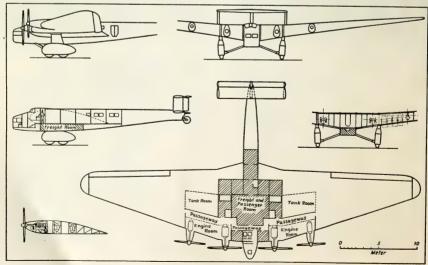
carburetor. This line is enclosed by a special pipe, which in the event of fuel line breakage conducts the fuel outside the machine so it cannot enter the cockpit or come in contact with the motor, which is separated from the cockpit by a fireproof wall. The maximum speed of the F.13 is 125 miles per hour and its normal cruising speed, 106 miles per hour and 106 miles per ho

After the F.13 type was introduced, the Junkers company built several other types, including a three-seater monoplane with the wing above the cabin. Several of these were built and some of them have been in more or less constant use space 1924. Neither this nor the other types, among them some two-seaters with open cockpits meant primarily for mail transport, have been further developed. The company concentrated rather on the construction of the famous W.33 type, such as was used by the German aviators Hermann Koehl and von Huenefeld and their Irish friend Fitzmaurice in making the first crossing of the northern part of the Atlantic from Europe to America. This type of machine was primarily developed for goods transport, the place of the passenger cabin being taken by a cargo hold of 160 cubic feet. The machine is also well suited for aerial photographic work and for dusting crops. For the former work, part of the floor can be removed to admit the fitting of a camera; for the latter purpose the Junkers company has evolved a special high efficiency dusting plane. The wings have a span of 60.2 feet and supporting surface of 462.8 square feet. In general design and execution this machine is similar to the F.13. The over-all length is 35.7 feet. A single Junkers L5 water-cooled motor with 280 to 310 horsepower output is fitted, giving the plane a maximum speed of 121 miles per hour, while the cruising and landing speeds respectively are 95 and 56 miles per hour. In place of the Junkers motor, a 420-horsepower Jupiter or other similarly powerful motor can be installed, which, however, raises the speed by about five per cent. Fitted with the Jupiter air-cooled motor the model is designated W.34.

In the succession of Junkers models then followed the first trimotored passenger plane for two pilots and nine passengers. It still retains the characteristic features of the former models, though of course correspondingly enlarged. The machine has one motor in the nose and one each side of the cabin on the wings. This type is called G.24 and has a span of 98 feet, a wing surface of 1,018 square feet and a length of 50 feet. It weighs fully equipped, but otherwise empty, 8,800 pounds and is capable of transporting a gross load of 4,750 pounds. The wing load amounts to 13.3 pounds per square foot. Fitted with three Junkers motors of 280 to 310 horsepower output each. the G.24 has a maximum speed of 115 miles per hour, a cruising speed of 100 miles per hour and a landing speed of 64 miles per hour. Access to the cockpit is obtained through the passenger cabin. A feature of the G.24 is that it can be extensively dismantled. As in the other models, the passenger cabin with the integral stub wing forms the main supporting section, to which the other parts are attached. This construction allows the removal of the two wing sections on each side. The tail of the fuselage forms a special unit, which is attached to the main piece in a manner similar to that of the wing section. This division of the plane in several sections facilitates manufacture, repair and road or rail transport, should such become necessary.

Recently an improved model of the G.24, designated as G.24he, has been brought out for a Greek air transport company. This machine has a slightly smaller span, 96.3 feet, and larger chord. bringing the wing area up to 1,087 square feet while the length has been increased by two feet to 52 feet. By these alterations the aerodynamical qualities of the machine have been improved considerably. The motors have remained the same, but, although the full load flying weight has been raised to 15,420 pounds as against 13,550 pounds, the maximum speed was increased by 15 miles per hour to 130 miles per hour, the cruising and landing speeds respectively being 106 and 62 miles per hour. The wing load is about one pound higher than in the old G.24. The controls of these models are similarly arranged as in the F.13. Also tail skids are retained. though the Junkers Company is now beginning to employ more widely a tail wheel and wheel brakes.

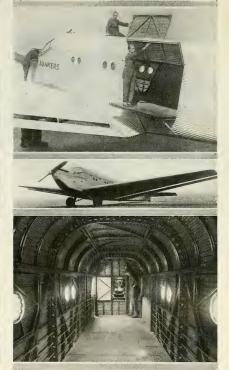
The G.24 was followed by a considerably larger sister model, the G.31 with a span of 99.4 feet and a wing area of 1,018.3 square feet (same as the older



Diagrams showing outlines and arrangement of the giant Junkers G.38 for passengers and freight services

JULY, 1931





Junkers G.38, the largest landplane

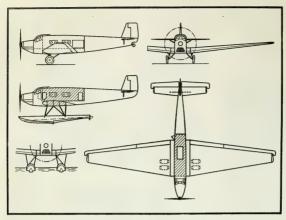
The Junkers Ju.52 freight plane

G.24). The length is 54 feet and fully loaded the ship weighs 17,580 pounds, which gives a wing load as high as 17.2 pounds per square foot, or almost twice as high as in the F.13. Without load the G.31 weighs 10,920 pounds, giving the machine a loading capacity of 6,660 pounds. In general design the G.31 shows considerable modifications as compared with the G.24. It has a large luggage bunker beneath the 17-passenger cabin and a large goods compartment between the cabin and the cockpit. A small room inside the goods hold is partitioned off for the wireless operator and another for an auxiliary gasoline motor driving a compressor which supplies compressed air for starting the motors. The goods compartment has one large door on each side leading out on the stub wings. The whole wing is subdivided into the stub wing integral with the cabin structure, two intermediate pieces on each side (one carrying the side motor, the other fuel tanks) and the two end sections. Also the fuselage is subdivided, but in a

different manner from that of the G.24, in which the tail piece is removable. In the G.31 only the head piece with the cradle for the central motor can be detached. The main fuselage body comprises five internal compartments, the first being the cockpit, the second the cargo hold and the remaining three the passenger quarters. All these spaces are connected by doors so that the pilots can go through the entire ship. The lavatory is arranged beside the last row of seats. Access to the interior of the fuselage tail end is obtained by removing the last seats and a panel behind them. As all other Junkers transport planes, the G.31 is provided with dual controls. Compared with the G.24 the empennage of this machine is, however, considerably modified. The compensated ailerons run the whole length of the wing end sections from the tips to the joint with the intermediate sections, and two rudders of smaller dimensions are employed instead of one. The rudder fins stand on the stabilizer surface and their upper ends are connected by a small airfoil. The stabilizer can be adjusted by the pilot during flight from the cockpit. All control rods, levers and surfaces have roller bearings and the control rods and cables leading to the tail pass through a channel inside the fuselage below the cabin floor. The tail cap of the fuselage is hinged on one side and when opened gives access to the skid and empennage controls. The fuel system is similar to that already described and the tanks hold a total of 463 gallons. The controls are so designed that the machine may be flown safely and without increased effort on the part of the pilot with only two motors in operation.

The well-known mammoth plane, the G.38, described in the December, 1929, issue of AERO DIGEST, was the one next introduced by the Junkers Company. Tests of the machine were not completed before summer, 1930. The machine is now ready for production and may, therefore, now be listed among German

(Continued on following page)



Arrangement of the single-engined Ju.52 freight plane

(Continued from preceding page) transport planes. The general features of this machine have so often been referred to recently that a complete description may well be dispensed with. The same constructional methods that have proved so efficacious in the other models have been adopted in the G.38. But in the general design the machine constitutes a departure from the former models. The G.38 is, in fact, an intermediate step to the still larger all-metal plane, the drawings for which have long been completed. This future plane, as already indicated, will consist practically entirely of the wing and will, therefore, have very little head resistance and be exceedingly economical. The G.38 closely approaches this. The weights are extensively decentralized and distributed over the wing structure, the fuselage serving solely to carry the steering surfaces. In Germany considerable progress is being made in the investigation of the problems attending the construction of tailless planes. Numerous small planes of the tailless type are in existence in Germany and the experience gained with them is a valuable fundament for the future Junkers plane, which will have no fuselage whatever. The fuselage of the G.38 has a length of 75.4 feet and it does not lie on top of the wing, but is located in between the wings, the top being flush with the highest part of the latter, while the bottom protrudes approximately two and one-half feet below. The span of the wings, which are also built in sections. measures 147.6 feet. As the thickest portion of the wings is six feet high at the roots, there is ample headroom inside them, and although they have a very pronounced taper toward the tips and a back-sweeping leading edge, a mechanic may go a considerable distance inside them in the direction of the tips. The

fuselage nose projects in front of the wings, but does not carry a motor. This part constitutes the chart room and is the station of the commander. The pilots are seated on a kind of platform to which steps lead up from the chart room, They are able to speak with the commander, although their heads are more or less inside in a superimposed small glass cabin which gives them good vision. Immediately behind the two pilots' seats and separated by a wall is a transverse passage running right and left into the wings. This is the central motor control station and continuations of this passage on either side give access to the four motors, which are located two in each wing, so that mechanics can attend to them during flight. The motors are connected with the propellers by means of propeller shafts and spur reduction gears. These are mounted on horizontal conical projections on the leading edge. At present the plane still has the first provisional motors, the two inside motors developing each 600 horsepower and driving fourblade propellers, the two outside with an output of 400 horsepower each, driving two-bladed propellers. It is intended later to substitute the new Junkers Diesel motor for these and to increase the power output at least to 2,400 horsepower, for which the machine was originally designed.

The G.38 is primarily meant for the long-distance transport of goods, but if desired, passengers can also be carried, in which case the rear portion of the tuselage can be equipped as an ordinary passenger cabin as it has side windows; the space within the wing has only top lights. The machine has not yet been taken into regular service. Probably it will ultimately be employed in the transcontinental service down to China. The machine weighs with full equipment 28,-

600 pounds and has a loading capacity of 24,200 pounds, making the total flying weight, when fully loaded, 52,800 pounds.

The latest addition to the Junkers range of models is a goods transport plane Ju.52, developed from the succesful W.33 type. It is a low-wing monoplane with a span of 95.14 feet and a wing surface of 1,248 square feet. Fully equipped but otherwise empty, it weighs 8,800 pounds and is capable of transporting 6,600 pounds. The wing load is somewhat higher than that of the W.33, amounting to 12.3 pounds per square foot as against 10 pounds per square foot, yet the landing speed is lower, being 45 miles per hour instead of 53 miles per hour, while the maximum speed of 121 miles per hour is the same. The cruising speed is 100 miles per hour, which is four miles per hour higher than that of the W.33. The prime consideration in designing this plane has been to obtain as large a radius of action as possible. For this reason an economical water-cooled motor, one of the new BMW V11 aU of 685 horsepower maximum output, has been selected. The plane with the motor set for most economical working will carry a paying load of 3,200 pounds a distance of 1.240 miles without stopping, or it will transport in five and one-half hours a paying load of 4,780 pounds, the distance of 560 miles between Berlin and London without stopping. The ability to keep in the air so long compensates fully for lack of a higher speed, which could only be obtained at the expense of economy as it would necessitate employment of a larger motor requiring more fuel and more intermediate stops for the transport of any given weight.

The Ju.52 has a clear goods hold approximately twenty feet seven inches by five feet four inches by six feet two inches, to which easy access is insured by broad hatches at the sides and in the roof. The opening in the latter measures five feet seven inches by four feet three inches; the side hatches measure five feet seven inches by two feet eleven inches. Additional cargo space for small piece goods is located beneath the main hold, which is reached by several small hatches.

The main hold, having a clear head room of six feet three inches, can easily be transformed into a commodious cabin if the need arises. While the wings are attached in the usual manner to the stub wings, the ailerons are wholly different from those of the W.33: they extend the entire length of the wings and are hinged on brackets below their trailing edge, forming a distinct slot. This is the arrangement adopted in the G.38. The normal fuel tanks hold 2,200 pounds, which will keep the machine in the air for about nine and one-half hours and allow it to fly a distance of 930 miles. Additional tanks can easily be installed inside the wing.

(Other German transport planes will be described by this author in forthcoming issues of Aero Digest.)

# The 1931 GREAT LAKES Sport Trainer

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AIRCRAFT

Army and Nav

# PERSONAIRLITIES

M AJOR GENERAL JAMES ED-MOND FECHET, Chief of Air Corps, joins this gallery of famous and sometimes notorious characters not by virtue of the fact that he is a Major General, but because he is a pilot. If a Major General of Cavalry galloped up to me on a horse and said, "Give me and this horse a write-up," I'd say, "Sorry, General, but I can't do it. I can't permit a mere horsegoing General to canter into the company of such distinguished pilots as Jerry Mc-Clelland and Pop Cleveland, You'll have to trot over to the horse division of the City Disposal Department to get any attention at all. Off with you, General. And if that horse has anything to add to the discussion. tell him to wait until he gets outside."

No, Major General Jim Fechet is here because as a pilot he's a credit to this department. Incidentally, the tone of this sheet has been falling of late, and I'm glad to boost it with the presence of a big military man. After movie pilots something must be done to raise the standard.

General Fechet is a young fellow of 53. He won't be even 54 until August 21, 1931, for he was born in 1877, at Fort Ringold, Texas. His father was the late Lieut-Colonel Edmond G. Fechet, who was cited for gallant service at Antietam. As a boy, Jim Fechet was with his father in Texas during the campaign against Geronimo, and he lived his life on a horse. He only got off at night. This was tough on the horse but it gave Jim Fechet the wonderful constitution he enjoys to-day, and made him quick-thinking in emergencies.

When the horse went up, the embryo general had to figure instantly where he would be when he came down—no mean feat with a horse from Texas. And after the descent, if the horse wasn't there, he had to decide in an instant on what part

Army Air Corps Photo Major General Fechet



of his anatomy it would be well to alight. He is sometimes referred to as a hard-headed old boy—which seems to be a legacy of his early days on and off a horse. He has made some of his snappiest decisions while half-way between the back of a broncho and a low lying cloud. In fact, it was his early experiences with horses that made him air-minded; and it was often remarked that Jim Fechet could bounce higher and come down harder than any man in those parts—an enviable reputation indeed.

His education was reluctantly received in the public schools of Jackson, Ohio, the Worthington Academy at Lincoln, Nebraska, and the University of Nebraska. In April, 1898, completely filled with scholastic information, James E. Fechet enlisted as a Buck-Private in Troop D, Sixth Calvary. The Spanish-American War was being laughingly fought at that time by Colonel Theodore Roosevelt and a few war correspondents, so Private Fechet rose rapidly through the grades of Corporal and Sergeant, has never, in fact, outlived the marks of that rank of Sergeant, for even to this day he has all the earmarks of a particularly hard-boiled Top Kick. Even Washington has failed to leave any mark on him. The numerous teaswarreys of Washington that his position have forced him to attend have failed to leave any lasting imprint on his rugged character, and unlike a few generals and admirals, there has never been even a suspicion that General Fechet made his own underwear in off moments.

I am trying hard to treat this great soldier with the dignity and solemnity his rank and attainments deserve, but I find myself somewhat handicapped by a casual friendship that has existed between us for the past few years. To me-and I believe the ma jority of the Air Corps-he is not so much the Major General commanding as he is the lovable and understanding human being who is far bigger and finer than any dignity that rank may confer upon him. If he wasn't going to see this, and if we weren't going to meet again. I'd go on to say much that is in my heart, but as he is the sort to call me hard names, and possibly punch my head for praising him too highly, I'd better content myself by saying that those who know him will know all I would say anythow, and those who don't know him would fail to understand.

At the close of the skirmish known as the Spanish-American War, in 1898, Sergeant Fechet was appointed a Second Lieutenant of Cavalry. He had been severely wounded in the battle of San Juan Hill. On February 2, 1901, he was appointed First Lieutenant-and there he stuck for ten years. First Loots in the Air Corps probably will appreciate his feelings. On March 30, 1911. some of the Cavalry must have passed away or fallen off the 'osses, for in a flash he was appointed Captain. In 1904 he had graduated from the Infantry and Cavalry School at Fort Leavenworth, though I doubt if they imparted any information to him about horses that he didn't have already. He was known as an expert horseman and one of the best shots in the nation-he could shoot a seven at will. During the Philippine Insurrection he fought on the Island of Samar, and in 1916 he served with General Pershing's punitive expedition into Mexico. They went down there to catch Villa, but caught everything else but. That was in 1916

During the great war Captain Fechet held a dizzy rush of temporary commissions. He became Major, Lieut.-Colonel, and Colonel in rapid succession. He had barely time to purchase new hat insignias for each rank when he was moved on to the next one. On June 31, 1920, he was brought up with a round turn, and shot back to the lowly depths of a Majority. Next day, however, he became a Lieut.-Colonel—did you ever hear of such a thing? There's no keeping track of him. A case of "Good morning, Major. How are you feeling to-day, Colonel? I hope you feel better to-night,

His interest in aviation began with the birth of the flying machine, but I am glad to report that he never flew gliders. In this respect he is unique. In August, 1917, he was placed on duty with the Aviation Section of the Signal Corps, took his flying training at Scott Field, and emerged as a Reserve Military Aviator. On November 13, 1918, he was rated a Junior Military Aviator, and was done with the horses for good. During the late war General Fechet was in command of various flying fields-Scott, Carlstrom, Dorr, and Kelly. He was always on the move. He was Air Officer of the Southern Department from May, 1919, to Sept. 1920, and on Aug. 5, 1920, he was permanently transferred to the Air Corps, and assigned to duty in the office of the Chief of Air Corps, first as Chief of Training and Operations and later as Chief of Training and War Plans Division.

On July 1, 1924, he was detailed as Commandant of the Air Corps Advanced Flying School at Kelly Field, Texas, a place where the youth of the land get led gently into the air by their kindly instructors-and get as gently eased out if they fail to make the grade. I understand the whole process in these times of peace is extremely refined, and quite unlike the method in vogue during the old days of the great conflict, when a massage over the dome with a spare joystick was regarded as about as good a way as any of imparting aerial information. However, the modern output-judging by the young men I met on the Army maneuvers-is not only up to the old standard, but far ahead of it. At least, we leave them at Kelly now until they shed their pinfeathers, a thing never thought of in the old hurried days when mere chickens were shoved through the Kelly brooder in a few weeks and then turned out to scratch for themselves over in France, easy victims of the old hawks who had spent months at the front.

Let's see-where did I mislay the General? Oh, yes-on April 27, 1925, a long and useful career was rewarded by an appointment as Brigadier-General and Assistant Chief of Air Corps. On December 13, 1927, at the age of fifty, he was appointed Major-General and Chief of the Air Corps, succeeding General Mason M. Patrick who retired for age. General Fechet retires himself this year, after more than 33 years in the Army of the United States. He leaves the Army Air Corps the better for his guidance of it, with the knowledge that he has done his duty splendidly as a highly efficient officer. Better still, he leaves it with the affection and respect of all who have served under his command.

The Army Air Corps war maneuvers in May offered General Fechet the opportunity to add to his fame, during his last year in command, by taking to himself the credit of commanding personally the greatest concentration of military aircraft ever gathered together in peace or in war. It certainly would be a natural ambition to want to do this; and it would have been General Fechet's right to assume command personally. But instead of doing what a lesser man probably would have done, General Fechet gave the command to Brigadier General Benjamin D. Foulois, because in doing so he also gave to that distinguished and capable officer the opportunity to distinguish himself as a brilliant air commander, eminently fitted to assume command of the Army Air Corps upon General Fechet's retirement.

General Fechet flew to Dayton in his own ship. He came, not as the general commanding the greatest tactical mission any air force had ever embarked upon, but merely as a visitor. All of the honor and the praise that he might have won for himself, he gladly saw given to his assistant. It would take someone like Jim Fechet to do that.



Army Air Corps Photo

Brigadier General Pratt

THE chap who started the Boy Scout movement, which is founded on the belief that a youngster should perform one good act a day, may have got the idea from a study of the life of Henry Conger Pratt, now Brigadier General in the Air Corps, United States Army. I haven't the least doubt in the world that as a small lad he started his career as mother's little helper. I found this opinion—for it is merely an opinion—upon a study of General Pratt's later years, from his youthful career in the army, to his present position as Chief of the Materiel Division at Dayton.

He has specialized in helping people, and is still hard at work on his specialty. The latest person he has helped is Brigadier General Benjamin D. Foulois, Assistant Chief of the Air Corps. He helped Foulois to put on the greatest air maneuvers ever staged. If it hadn't been for the perfect functioning of the Materiel Division, for the excellent equipment they have developed and perfected through the years, such maneuvers as General Foulois directed so brilliantly would have been impossible. Without the work performed-usually without benefit of publicity-by General Pratt and his staff, we would have witnessed the sad spectacle of airplanes landing all over the country with a variety of troubles. But thanks to the mechanical perfection developed by the Materiel Division under Brig.-General Henry C. Pratt, the maneuvers were a suc-

I rise in my humble but mildly insistent way to demand that a share of the credit for these maneuvers be accorded this quiet helper, this Boy Scout from away back. He is one of those people we call the salt of the earth. Others hold the position in the limelight—as they should—but, probably against his will, I shall get a firm hold on this helpful Pratt and drag him forth to blink in the light.

At Dayton I had the pleasure of meeting Mrs. Pratt. General Fechet introduced us. "I want to ask you who you are," she said. "I'm curious about you. I've seen you around here for three days, and every time I see you someone is taking you by the arm and leading you aside to tell you something. I've seen Generals, Colonels, Majors, Captains, Lieutenants, and even Congressmen earnestly telling you things. And you are always listening and nodding your head. Who are you? And what are they telling you?"

Now, there is a mighty smart woman, Mrs. Henry C. Pratt. Just an occasional glance in my direction had given her the key to my character. She was onto me in a minute. She knew that I was one of those strange people-a born listener. That is a fact that mighty few people have discovered, so I give Mrs. Pratt credit for great perception. You see, I do so much talking myself-I'm often noisy, in factthat few people have discovered that I do far more listening than I do talking. That's the only way I have ever learned anything, by listening. People have been mighty kind to me, all my life. They've started to talk to me, found out from my conversation that I knew practically nothing about anything, felt sorry for my ignorance, and then proceeded to enlighten me. I've spent a lifetime being enlightened by countless people on numberless subjects, until today there is scarcely a subject in the world about which I haven't a large fund of mis-information.

However, I merely mention thal to show you what a clever woman Mrs. Pratt is, and to drop a hint that part of the administrative ability of General Pratt is undoubtedly derived from Mrs. Pratt. A man can't have a smart woman like her around him and remain just an ordinary man; he's bound to forge ahead—or she'll know the reason why. Now I'm wondering if I've sized Mrs. Pratt up as accurately as she sized me up. But I suppose I'll never know. When a man flatters himself, that he understands a woman, he flatters himself, that's all.

Getting back reluctantly to the less ornamental member of the family, we find that Henry C. Pratt was born in New Mexico, September 2, 1882. He has always done things in a big way. Most of us, for instance, pick out some town in a state and get born in it. Not Henry Conger Pratt. He simply took the whole of New Mexico, used it to get born in, and then moved away. At least, that's what I conclude from perusing three different biographical releases about him put out by the Army Information Section. They say, simply, "Born in New Mexico, 1882."

General Pratt comes of an old Army family. They've been living off the country for years and years. His father served with the Union forces during the Civil War—a struggle remarkable for precious little civility on either side, by the way—and at the time of his death was a Captain the Infantry. General Pratt's grand-



Dayton Morning Journal Photo

Cy Caldwell (right) amazes Major Spatz with ideas on how the air maneuvers should be conducted; General Foulois (left), paying no attention, was remarkably successful in carrying out the air exercises

father and two of his uncles were also officers in the Army. Apparently the Pratts were a family that refused to perform any productive labor-and who blames them? But it remained for a great uncle of the General's to move further away from hard work than any of them. He became an Admiral in the Navy-but perhaps the less said about that, the better. Every family has one black sheep. However, one lone Pratt means practically nothing in a Navy the size of ours. All I know about that particular Pratt is that he was in the Navy, died an Admiral-and several years later they discovered that he really was dead, and so buried him. What the Navy needs is to have Frank Campbell, the famous undertaker, inspect the Admirals in the front offices every so often to discover which ones should be carted out of there, and when a live one is found, he should be transferred to the Bureau of Aeronautics as an assistant to Admiral Moffett.

General Pratt, who in 1900 was just another Pratt, was appointed to the Military Academy, from Wisconsin, graduated June 15, 1904, and appointed a Second Lieutenant in the 4th Gavalry. That was in the days when you could actually get some place on a horse, even in a war, and young Pratt doubtless pictured himself helping someone to lead a charge. There he was-in imagination-putting the spurs to gallant Cuspidorus, the pride of the regiment, and with flashing sword held high, galloping down on the embattled Republicans, scattering them to right and left along Pennsylvania Avenue, thus emptying the streets and filling the speakeasies in practically no time. This bright picture, however, never went into production, and the impending star, after various odd jobs on a horse, finally drifted into what was to become his life's

work—helper to the army at large. But before we come to the serious work of this remarkable officer, let us look at his early, or formative period.

He served first at Fort Leavenworth, Kansas, from September 15 to October 15, 1904. Right here we get a glimpse of the genius that was latent in Pratt-one month in Kansas and he was galloping off to the Presidio, at San Francisco. If he had stayed in Kansas, where would he be today? Well, look what happened to Carrie Nation, He spent a year amid the civilizing influences of San Francisco-after starting in New Mexico there was much civilizing to be done to him-but on Sept. 5, 1905, they either decided that he was civilized, or else they gave up, for the next thing we know he is off to the Philippine Islands, where he spent the next two years in Moroland, home of the Morons. He never saw Manila for more than one day, when they shipped him off among the Morons-an experience that was to prove useful to him when he got back to Washington, stamping ground of wild meat-eaters from 48 states, all depressed. He served among the Moros for two years, and, after a couple of more years at a deadly place called Fort Snelling, Minnesota, he became Aide-de-camp to President Taft and Assistant to the Officer in Charge of Public Buildings & Grounds of the District of Columbia. This was on April 9, 1909, and marked the date of his official nomination as helper to the world at large.

But perhaps I should explain what the duties of an Aide-de-camp are. In general, his position is always the affirmative one. His superior officer says something —no matter what—and the aide-de-camp agrees with him. If he doesn't, he ceases to be of any further assistance to that par-

ticular officer. This profession has reached its ultimate development in Hollywood. However, in 1909 the art was still in its infancy, and Henry C. Pratt had not learned its finer shadings, so when President Taft said, "Do you think I've lost any weight recently?" the innocent Pratt, fresh from the Moros, said, "To tell you the truth, William, I don't believe you have." After that he was left to roam around the Public Buildings by himself.

But it was a good lesson for him, for on March 9, 1911, when he became Aide-decamp to Major General W. H. Carter at San Antonio, Texas, he worked at his profession with such zeal that he was promoted to First Lieutenant and assigned to the 9th Cavalry March 30, 1911. On August 8 of that same year, President Taft decided to forgive Lieutenant Pratt for being truthful, and again made him his Aide-de-camp. "Am I any thinner?" the President asked casually, just to test him out. "Much thinner," replied the ready-witted young Aide. "In fact, I'm worried about you, You're falling away to nothing. Something should be done about it. Are you not taking too many vitamins and ignoring the carbohydrates?" Greatly pleased at this answer, President Taft ordered pigs knuckles and sauerkraut and two hunks of apple pie.

This incident really got Pratt started on the helper, or aide-de-camp business. In December, 1911, he became Aide-de-camp to Major General Arthur Murray in Washington and in San Francisco, until December 14, 1912, when he was assigned to the 1st Cavalry at Presidio of San Francisco, and served with that regiment until January 23, 1915. It was a real vacation to a hard-working aide-de-camp. He went for long walks, during which he would say, "No! No, General! No, Mr. President. No, no, no!" It was a real relief to him after all those months as Aide-de-camp. However, during practically the whole of 1915 he had to get back in the affirmative business again, and nod whenever Major General Arthur Murray said anything. His heart, by that time, was not in his work. Instead of saying yes, he merely nodded, noting which the Army promoted him to Captain of Cavalry on July 1, 1916, and made him assistant adjutant of the El Paso District.

As this practically finished his appointed career as official helper to the mighty, we may now regard Captain Pratt as being embarked entirely on his own. He spent a year or so in the Cavalry, apparently thinking things over, during which he went to Hawaii and served at Schofield Barracks with the 4th Cavalry until October 3, 1917, when he saw plainly where the horses were bound. On August 5, 1917, he was promoted Major in the Aviation Section of the Signal Corps, where during the next year he served at Kelly Field, Texas, Call Field, Wichita Falls, Kansas, and from January to September 21, 1918, commanded the Aviation School at Brooks Field, Texas. On February 26, 1918, he was promoted to Lieutenant Colonel and on August 20, 1918. he became Colonel (temporarily), Air Ser-(Continued on page 94)

# JOINING THE CATERPILLARS

Brief Accounts of Emergency Jumps Which Won Membership in This Unique Organization

T HE parachute which carried Wallace Franklin, glider designer and builder, safely to membership in the Caterpillar Club was stamped "Built September 23, 1930." Franklin wore it on September 28 and in the first five minutes used it to save his life.

The glider manufacturer was piloting a large saiplane when he struck the path of a tornado which took the wings off and forced the pilot to take to his 'chute. In spite of the high wind he landed smoothly and safely in a small clearing, the only open area in the midst of thick woods. The parachute was a Flowd Smith thirty-foot back-pack type.

The ship through which Franklin was initiated into the mythical club of fliers was a sailplane designed and built especially for use at Elmira during the first National Soaring Contests. ship was completed a week late and the company had been unable to build a trailer for it. Consequently the only way to transport it to the soaring site was to tow it behind an airplane. In spite of a rather heavy gale which was blowing, the pilots of the tow plane and the glider took off from Ypsilanti Airport, They circled the field for a slight check of the rigging and headed south. Immediately they struck some extremely rough air and then what Franklin characterized as the worst bump he ever experienced.

Franklin describes his jump as follows: "The ship went out of control. I looked to see why and there saw that there was no left wing. I released the tow line. By that time the glider was in a very bad left spin. I chose to go out over the right side. I had about 2.000 feet of altitude at the time so I fell free for, I imagine, about 500 or 600 feet in an attempt to keep clear of the wreckage. The 'chute opened beautifully. I was much surprised at the smooth stop to my fall and at first wondered if everything was all right. I glanced up at the 'chute and saw that it was open and everything was O. K. except for the fact that the air was filled with debris from the wreckage. The 'chute had no more than opened when I was disturbed by a swishing noise and looked to see the last of the wreckage pass within twenty-five or thirty feet of me. I landed easily in a small clearing in the midst of a thickly wooded area.

"Roy Nass, pilot of the tow plane, landed alongside me in the field. We took a pair of pliers and a screw driver to the wreckage of the sailplane hoping to save the instruments. We were amazed to find that except for the loss of both wings and slight damage to the tail, the glider was in almost as good

condition as when it left the airport five minutes before.

"We discovered we had hit a twister as there was a groove cut through the woods for two or three miles where the trees were torn up."

W HEN a wing of the glider he was testing folded up, Tex Frolich of San Francisco took to his parachute and landed safely as a member of the Caterpillar Club—probably the first to be initiated through a disabled motorless craft.

Frohlich had been testing a radical effying wing" type of glider on the western coast and had made several successful flights. On the afternoon of May 9, 1930, he was soaring at an altitude of about 700 feet when the structure made a sudden drop and the end of one wing folded upward. The glider fell, out of control. At about 400 feet the pilot rose in his seat and pulled the rip cord of his parachute. In spite of the low altitude from which the pilot jumped, the parachute checked his descent in good time and he landed unhurt.

Frohlich attributed the accident to the fact that the glider had received a severe jolt in transportation which, in spite of the fact that the wing seemed intact, probably cracked the spar, resulting in its collapse when the craft struck a bump in the air.

The pilot had previously made two practice jumps and believes that his jump from the glider demonstrated the value of such training. "The merit of emergency parachute equipment in flying of any kind is too well-known to necessitate any further comment at this time. However, my experience caused one thing to be driven home hard. That is the need of a training regulation requiring not less than one prearranged parachute descent from a flying airplane by every



Private Osborne calmly awaiting rescue

applicant for limited commercial or transport pilot's license.

"My own drop terminated as 'parachute descent' less than seventy-five feet
from the earth," Frohlich said. My jump
was almost instantaneous with my perception of the wing failure and I am
confident this prompt action was directly
the result of my two previous voluntary
drops which acquainted me with parachute take-off and operation. In this
case the prompt bridging of the gap between sensation and appropriate action
meant the difference between safety and
a serious injury or even fatality."

~~~

P RIVATE HAROLD R. OSBORNE of the 27th Pursuit Squadron, Self-ridge Field, Michigan, knows the sensation of relief in the knowledge that a second parachute carried as a precautionary measure will be the means of saving his life. For Private Osborne once dangled from the shroud lines of a disabled 'chute waiting to be released in order that he might continue his journey from airplane to earth in good order.

Scheduled to make a live parachute jump, on June 5, 1931, he settled himself in the front cockpit of a Douglas observation plane, wearing a regulation parachute and a small reserve 'chute. At an altitude of 2,000 feet, Osborne made ready to climb out. In some way his parachute became released too soon. 'He felt a sharp jerk above and found that his descent had been suddenly arrested. Looking upward, he discovered that the 'chute had caught in the counterbalance of the elevators where the strong slipstream lessened any chance of its becoming disengaged. He was left swinging pendulum-like, which prevented the pilot from making a landing.

There was considerable comfort, Osborne said, in the realization that the second 'chute would carry him safely to earth if he could only disengage the disabled parachute from the plane above. But he also knew that he would have considerable difficulty in effecting his release.

Observers from below, however, had seen the jump and he was not left long in his plight. Within a few minutes a second plane was in the air, carrying aid to the unfortunate jumper. A knife was lowered to Osborne and he succeeded in cutting the shroud lines of the torn 'chute. Falling free once more, he pulled the cord of his reserve parachute, which opened immediately. Settling into a long, lazy comforting normal drop to earth, he made an easy landing with the small reserve parachute.

# THE AIR SERVICES

#### AIR CORPS SETS SAFETY RECORD

WITH the completion of the annual maneuvers of the U. S. Army Air Corps last month, officials began a review and study of the results to determine the value of large-scale aviation operations as a means of carrying an offensive warfare and as a weapon of national defense. While it must of necessity be some time until the lessons learned are thoroughly digested and complete figures are compiled, it was apparent by the time the maneuvers had been concluded that a record of safety had been established.

The First Air Division, organized for the purposes of the maneuvers this year, was disbanded at Washington, D. C., on June 1. Participating pilots had flown more than 2,000,000 miles and spent a collective total of approximately 37,000 hours in the air without a fatality or serious accident by the time they reached Washington. Many of the pilots engaged in the maneuvers flew over unknown territory, landed on strange airports and encountered adverse weather conditions. Virtually all flights were made in formation, requiring the maximum of judgment and skill in piloting. More than 1,000,000 miles and 19,000 hours were to be completed by pilots en route to their home stations after the termination of the maneuvers at Washington.

It has been estimated that the 672 planes taking part in the exercises put in more hours between May 9-30 than were flown by American Expeditionary air forces over enemy lines during the World War.

#### Plan Joint Air Corps Anti-Aircraft Maneuvers in 1932

THE annual maneuvers of the Army Air Corps in 1932 will be held jointly with anti-aircraft forces, according to present plans recently announced by the War Department.

The object of the maneuvers next year will be to test the materiel, tactics and technique of anti-aircraft artillery in the defense of an area. An opportunity will be afforded for the Air Corps to gain valuable information with regard to the attack of localities defended by anti-aircraft artillery. Existing commercial lines of communication and the civil population will be used to effect the rapid transmission of anti-aircraft intelligence.

Navy to Develop Speedier Aircraft TO DEVELOP greater speed in naval aircraft, an experimental and research program will be undertaken immediately after July, according to a recent announcement of the Bureau of Aeronautics, Navy Department. This particular program is financed by an appropriation of \$225,000 which is in addition to an appropriation of \$2,000,000 for experimental work the next fiscal year.

The program of developing greater speed in naval aircraft will be limited to efforts to develop improved powerplants and will not include aerodynamic research to improve the characteristics of naval planes. Detailed plans for the research work have not been drawn up because no decision has been made as to the type of engine on which efforts will be concentrated. A campaign over a period of many months will be undertaken, however, and independent research work by the aeronautical industry will be encouraged.

While it was said to be possible that the results of such a program may be applicable to racing aircraft, the primary purpose of the Bureau of Aeronautics in this campaign will be to improve the performance of service planes only, according to a Navy Department announcement. The speed of service planes depends upon and is the result of experience gained through the construction of racing planes, it was stated, but development of high-speed aircraft for international competition would require such a large sum of money that the present campaign will not be conducted with this objective in view.

#### Personnel of Airship Akron

OFFICERS who will command the crew of enlisted men selected to man the navy's new dirigible Akron, include the following: Lieut-Comdr. Charles E. Rosendahl, captain; Lieut-Comdr. Herbert V. Wiley, executive officer; Lieut-Comdr. Bertrand J. Rodgers, engineer officer; Lieutenants Roland G. Mayer, Richard R. Dennett, Harold H. Pickens and Wilfred Bushnell; and Chief Machinist Emmett C. Thurman.

A crew of sixty-three enlisted men has been selected to man the dirigible, scheduled to fly first his summer. The wartime complement would be seventy-five men. Fiftyone enlisted men will be attached during the trial flights. The remainder will form the airplane unit to be attached after the Akron is delivered to the Naval Air Station, Lakehurst, N. J.

#### More Planes Available for Air Corps Reserves at Mitchel Field

THERE will be twice as many service type ships as heretofore at the disposal of Air Corps Reserve officers on flying status duty at Mitchel Field, L. I., according to information recently made available. In addition, Reserve officers will not be required to relinquish practice flights with the advent of the regular summer training camp period. This year, it is reported, as many or more officers are to be called for active duty as were ordered to Mitchel Field in 1930.

Orders from Major General Hanson E. Ely, Commandant of the Second Corps Area, direct that not less than four service type ships, in addition to available training type planes, be made available each flying day, including Saturdays and Sundays (except during the period of training camps) for inactive Reserve flying by those Air Corps Re-

serve officers authorized to fly. During the period of training camps, there will be provided two service type planes and at least one training type plane for inactive Reserve flying. These will be in addition to the equipment provided for active duty flying.

#### Navy Begins Experiments With Autogiro to Test Value for Naval Operations

A Pitcairn-Cierva autogiro equipped with pontoons has been acquired by the Bureau of Aeronautics, Navy Department, for experimental use to determine its value for naval operation, according to a recent announcement of Department officials. The navy will test the autogiro from aircraft carriers and restricted decks on other types of naval vessels. An ultimate objective will be to land the craft on the deck of a battle-ship. The experiments will be undertaken to determine whether the autogiro will be a permanent addition to the navy and whether similar craft will be ordered.

The Pitcairn autogiro was contracted for on January 22, by the navy and was delivered to the Naval Air Station, Anacostia, D. C., on June 1. The plane, assigned to the aircraft carrier Langley, has been classified by the Navy as the XOP-1. Tests will be made to determine how easily the autogiro can be managed and in how small a space it can be landed, in small landing places both afloat and ashore.

The navy's autogiro has a specified weight of 2,807 pounds and is a two-place machine. Powered with a Wright Whirlwind 300, the plane is designed to have a high speed of 125 miles per hour, a four-hour endurance at economical speed and a ceiling of 16,400 feet.

#### Complete Trial Tests of Loening Folding-Wing Plane for Submarines

TEST flights of the experimental folding-wing airplane, constructed by Grover Loening for use on submarines, have been passed "more or less satisfactorily," according to information recently made available by the Bureau of Aeronautics, Navy Department. A few undesirable characteristics which could be corrected in the construction of a second plane for this purpose were discovered during the test flights, conducted at the Naval Air Station, Anacostia, D. C. Various improvements brought out recently would be incorporated in any subsequent craft with folding wings.

The plane was built to specifications prepared after a study of the requirements for an airplane used in conjunction with the operation of submarines. Since that time, the fundamental problem of discovering whether an airplane of such small size can be constructed satisfactorily from the aeronautical point of view has been solved.

As yet no decision has been made regarding the next step in the definite program of determining the practicability of placing aircraft on all types of naval vessels.

### FOR ANOTHER YEAR THE CHALLENGER'S ENDURANCE RECORD STANDS!





WO years ago a Challenger engine won the record for endurance. Again last July a Challenger droned for 27 days and nights to win another

world's record. Had it flown straight away, it would have traveled twice around the world.

Today, after a score of attempts to break it, the Challenger's record for endurance still stands. And the new model is even better fitted to fly your ship. For Curtiss and Wright have put into this engine a number of improvements which add to its efficiency.

In essentials, the new Challenger is still the same engine that flew for 640 hours. But ingenious refinements give it more power without adding a pound to its weight. Its new government rating is 185 horsepower-10% more than the record-holding Challenger!

A new heater valve, an improved crankcase nose, lead bronze half shells fitted to the master rods, and a new air-cleaner, are but a few of the added details which step up its power and performance.

And you'll be pleased when you learn its unusually low price, and its low cost of operation. Go to your Wright dealer's. Get behind a Challenger and you'll want to fly it away! And remember that, in buying an engine by Wright, you buy Service within an hour's flight anywhere in the country!



# WRIGHT

AERONAUTICAL CORPORATION PATERSON, NEW JERSEY

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#### PERSONAIRLITES

(Continued from page 90)

Meanwhile he had learned to fly, and on September 12, 1918, he was qualified as Junior Military Aviator. After serving with the Division of Military Aeronautics to October 8, 1918, he sailed for France, fortunately missing the war. It seems the Germans got wind of the fact that he was coming over to help Pershing, so they gave in and asked for an armistice. And well for them that they did so! Colonel Pratt meanwhile had gone across, landed, looked around, and came right back again. He saw at a glance that all further fighting was going to be right in Washington, and he wanted to be in the thick of it. Again he leaped into the Division of Aeronautics. and stuck with it from Dec., 1918, to Jan. 11, 1919, when he became commanding officer at Kelly Field, Texas. In March of that same year, however, he returned to Washington, and was in the front line trenches of the Office of the Chief of Air Service until September 2, 1919, when he attended the General Staff College, now the Army War College, in the District of Columbia. If it was any further away, no officer above the rank of Captain would go to it. That's why they have it in Washington-in a desperate effort to educate the generals. The effort, I fear, has not always been attended with complete success.

General Pratt, by the way, is almost completely packed with information. In addition to that War College course, he attended the General Staff School at Fort Leavenworth, Kansas, in 1923; the School of the Line-whatever that is-in 1922: and the Air Service Bombardment School in 1921. This seems really too much for one mind to take in, but apparently the Pratt headpiece absorbed it all, for he was a distinguished graduate from the School of the Line in 1922, and is on the General Staff Corps Eligible List, which means that in case of war he's in line for almost any job far enough back of the front to be worth trying for. That's where I was weak in the last war-I knew so little that the only place they found for me to fill was actually coming to grips with an annoyed enemy.

On July 1, 1920, Captain Pratt became Major of Cavalry, and transferred to the Air Corps on August 6, 1920. Of course, you understand that Colonel business was a temporary war commission. They had Generals in that war who became mere Majors on the cessation of hostilities-a sad demotion indeed. I never rose so far, hence had less distance to fall back. In fact, all I ever rose to was Lieutenantand they just didn't have the heart to chuck me back to 2nd Loot. Static in war, static in peace, static in the hearts of my countrymen. It is my purpose, however, to become a Colonel in the next war. I shall be Colonel Corona Portable Caldwell, the bird who writes the atrocity stories and stirs you up to greater effort-the way George Creel did in the last war, the imaginative old word pusher! And to think you fell for it!

Well, well-to return to General Pratt.

Since 1920 he has commanded Kelly Field, been Corps Area Air Officer of the Eighth Corps Area, Chief of Training and War Plans Division of the Office of the Chief of Air Corps, Commanding Officer, Mitchel Field, New York, Air Officer of the Hawaiian Department, and Chief, Materiel Division, Dayton, Ohio. There is just one more promotion in the Air Corps we believe he is eligible for—Chief! Some are already putting him in the field to follow General Foulois.

#### General Fechet Visits Panama

A TWO-DAYS' inspection of the Canal Zone air defenses was completed recently by Mājor General James E. Fechet, Chief of the Air Corps. General Fechet reported after the inspection that no changes in the air defenses are planned. Piloted by Capt. Ira Eaker, General Fechet took off from Panama City June 10 on the return journey to the United States.

#### Navy Department Orders Forty New Planes and Engines

THREE contracts for planes and engines involving a total cost of \$767,942.07 were recently awarded by the Bureau of Aeronautics, Navy Department.

Ten O3U-1 observation planes were ordered from the Chance Vought Corporation, Hartford, Conn., costing \$115,112.57.

The Boeing Airplane Company received a contract for thirty F4B-3 fighting planes at a cost involving \$494.415.

Engines for these forty planes were ordered from the Pratt & Whitney Aircraft Company, Hartford, Conn., at a total cost of \$158,415.

The Boeing fighters, differing from former models in that the fuselage is of all-metal monocoque construction, will be produced for service aboard aircraft carriers and will be equipped with special arresting gear for landing on the decks. Each Boeing plane will be provided with two machine guns synchronized to fire through the propeller.

OF THE 672 planes comprising the First Air Division, organized this year for the purposes of the annual maneuvers of the Army Air Corps, ninety-one per cent were equipped with Haskelite plywood, according to a recent announcement of the Haskelite Mamifacturing Corporation, Chicago, III. The other nine per cent were all-metal planes, and some of these were equipped with Plymetl lining and floorboards.

CONTRACT from the War Department for 156 Wright Cyclone engines of 575 horsepower each was announced recently by Guy W. Vaughan, president of the Wright Aeronautical Corporation. The contract involved a purchase price of \$1,026,64.64.

#### Air Corps Officers Detailed As Students

TWENTY-SIX officers of the Army Air Corps have been detailed to duty as students for the 1931-32 course at the Air Corps Tactical School, Maxwell Field, Montgomery, Ala., reporting not later than September 15. Sixteen Air Corps officers have been detailed as students to take the course of instruction at the Air Corps Engineering School, Wright Field, Dayton, Ohio, for the next scholastic year. They were to report not later than June 30.

#### NAVY TESTS ELECTRIC WEATHER MAPS

EXPERIMENTS with weather maps, which electrically record changing atmospheric conditions, are being conducted by the Navy Department to assist airplane pilots in visualizing rapidly actual weather conditions along a scheduled route.

Experimental electric weather maps, developed and constructed by the navy, have been placed in operation at the Naval Air Station, Anacostia, D. C.

Current weather conditions in various localities are shown on the maps by means of colored lights. Marked changes in conditions and storm warnings are indicated by changes in colors of lights as well as by bell signals.

The electrical maps were developed under the direction of Lieut. J. B. Anderson, U. S. Navy, meteorological officer at Anacostia, and were constructed at the Navy Yard, Washington, D. C. If experiments with the maps prove their value, similar apparatus will be installed at the Naval Air Station, Hampton Roads, Va., and San Diego, Calif.

There are three maps in the system operating at Anacostia, one in the commanding officer's office, one in the pilot's ready room, and the third in the aerology office, from which all three maps are controlled. Weather information from points covering the Atlantic coast and across the mountains into Ohio

are received from thirty-six stations by means of naval radio, by radio and telephone from seven Army stations, and by hourly teletype reports from the Weather Bureau and the Department of Commerce. Reports from twenty-three stations are on regular hourly teletype schedule, and reports are received from practically all other stations every two hours. Lights on the new maps are turned off when the reports become two hours old

Good flying conditions are shown by white lights, undesirable flying weather is indicated at the various points by green lights and fogs, heavy winds and gale winds are indicated on the maps by red lights.

The area covered by the map at Anacostia is divided into three general zones. Along one side of the map is a strip panel on which are shown flying conditions prevailing in the three zones, and the force of winds at various altitudes within the zones. Expected changes in weather conditions are indicated on the map by the burning of two different colored lights.

Electric bells attached to the maps are used to call attention to the shifting of the colors of lights, and prolonged rings are used as warning of squalls, thunderstorms or line squalls. Photographs of new maps are available at the office of General Information, Room 3246, Navy Department.



#### THE BONES OF AN EAGLE

HE plumes or the tireless muscles and sinews of an eagle that communicate the power of his unfaltering heart are not more to be admired than the bones upon which the whole mechanism depends for leverage. Marvelous framework! Massive at a few points but at others almost as thin as the walls of a straw, and on the whole, light enough to ride the wind without effort, high above the clouds. Yet strong enough to bear every strain that arrow speed, quick reverses, or the rush of mighty storms may impose.

Let one of these bones be broken and the whole miracle of flight comes to grief.

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NATIONAL-SHELBY AIRCRAFT TUBING

### AERONAUTICAL INDUSTRY

#### FORD AIR TOUR TO START JULY 4

COMPETING and official planes comprising the National Air Tour of 1931, seventh annual competition for the Edsel B. Ford Reliability Trophy, will take off on July 4 at Detroit, Mich., to follow a 6,500-mile route and return to Detroit on July 24. More than twenty planes, it is expected by Manager Ray Collins, will compete for the Ford Trophy. These planes will be in addition to approximately ten ships carrying officials, press representatives and others. Among the first entries were a Sikorsky S-39 amphibion, States monoplane, Great Lakes Trainer, Mercury Chic, three Buhls, two Fords, two Birds and a Curtiss-Wright four-place ship.

This year the rules of the contest have been slightly changed in order to adjust various points of dissention among manufacturers and pilots concerning the formula used in previous contests.

Before the take-off, planes will be assembled at Ford Airport, Dearborn, Mich, and tested for a figure of merit based on various points of efficiency from the standpoint of safety, speed and reliability. These preliminary tests will be made to determine take-off time, landing time, high speed, payload and power necessary to climb the plane at the minimum angle. From these factors the formula has been arranged for computing the figure of merit. The average daily speed over the course will be added to the figure of merit to obtain the score of each competing plane.

Because of the unfavorable weather conditions prevailing in Mexico during July, plans for routing the tour into that country have been abandoned.

Under the revision of the route, each of



Walter Beech and the new Curtiss-Wright Junior pusher-type monoplane

the following cities will tentatively serve as a nucleus: Walkerville, Ont.; Binghamton and Watertown, N. Y.; Bradford and Pittsburgh, Pa.; Wheeling, W. Va.; Columbus, Ohio; Memphis, Tenn.; Birmingham and Montgomery, Ala.; Guliport, Miss.; New Orleans and Shreveport, La.; Houston, San Antonio, Ft. Worth and Wichita Falls, Tex., Oklahoma City and Ponca City, Okla.; Kansas City, Mo.; Little Rock, Ark.; Jackson, Miss.; Nashville, Tenn.; Lexington, Ky.; Akron, O., and Kalamazoo, Mich.

James H. Doolittle will replace Capt. Frank M. Hawks, now abroad, as tour referee. With this exception, the contest committee will continue as in former years, comprised of Ray Collins, manager; E. W. "Pop" Cleveland, starter; Arthur G. Schlosser and E. P. Crocker, chief scorers.

The first ten winners will be awarded a total of \$12,000 in prizes.

In addition to the Ford Trophy, the Great Lakes Light Plane Trophy will be awarded. The latter award will be competed for by planes having a piston displacement of not more than 510 cubic inches.

## National Soaring Contest To Be Held At Elmira, N. Y. THE National Soaring Contest of 1931

THE National Soaring Contest of 1931 will be held at Elmira, N. Y., August 2-16, according to a recent announcement of officials of the National Glider Association, sponsor of the meet in conjunction with the Aviation Committee of the Elmira Association of Commerce. Preparations have been started to secure take-off sites presenting facilities for pilots and accommodations for spectators. So that the program may not be interrupted in the event of calms, plans are being made to carry out a number of auto-towing training, auto-tow sport and airplane-facilities events.

It is reported that a minimum of \$3,000 in prize money will be available. The Edward S. Evans Trophy, now held and to be defended by Albert Hastings, will this year be awarded with the title of American Glider Champion to the pilot earning the greatest number of points in the various categories of the contest.

Only ships with enclosed fuselages may enter the contest. "C" pilots only qualify but pilots of all classes will be given an opportunity of earning higher licenses and flying in the contest.

Aviation Country Club Holds Annual Air Meet at Hicksville, L. I.

THE annual air meet of the Aviation Country Club of Long Island was held June 14 at Hicksville, L. I., N. Y. Eight competitive events and aerial demonstrations were scheduled on the program. More than 500 members and guests attended.

Eric Wood won a free-for-all race at a speed of 203 miles per hour, in a Gee Bee monoplane. Reginald Langhorne Brooks was second and W. F. Zelcer, third. Brooks won four of the eight scheduled events, flying either a Monosport or a Lockheed Air Express. S. S. Seversky placed first in a spot landing contest, with Betty Huyler Gilies second. In an aerial exhibition, Wood climbed to an altitude of 3,000 feet in fifty-four seconds.

#### Aeronautics Branch Extends to January 1, 1932, Effective Date for New Glider Licensing Regulations EFFECTIVE DATE of the Air Com-

EFFECTIVE DATE of the Air Commerce Regulations pertaining to the licensing of gliders under three classifications has been extended from July 1, 1931, to January 1, 1932, according to a recent announcement of Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics. Because there are still many gliders under construction which will not be ready for approval prior to July 1, it was deemed advisable again to extend the effective date of the regulations pertaining to their approval.

This extension of time will permit gliders constructed prior to January 1, 1932, to be eligible for license, regardless of design or manufacture, upon passing a Department of Commerce line inspection as to general design, workmanship and materials. Gliders constructed after that date shall fall within Group 1 or Group 2 classifications as follows, in order to be eligible for license.

Group 1—gliders built by manufacturers under an Approved Type Certificate and gliders constructed by someone other than the manufacturer but built in accordance with Approved Type Certificate specifications and design furnished by the holder of the certificate; Group 2—gliders constructed after January 1, 1932, not manufactured under A. T. C. but constructed in accordance with the requirements for an A. T. C. and to the satisfaction of the Department of Commerce; and Group 3—gliders built prior to January 1, 1932, which pass an inspection satisfactorily, but without regard to design or manufacture.

#### Harvard Flying Club First in Grover Loening Intercollegiate Contest For the second successive year, first prize

Loening Intercollegiate Contest
For the second successive year, first prize
in the Grover Loening Intercollegiate Flying
Contest has been awarded the Harvard
Flying Club, according to a recent announcement of the Contest Committee,
National Aeronautic Association. Aviation
clubs of universities and colleges throughout
the United States are eligible to compete in
this annual event.

New York University Flying Club received second prize and the University of Detroit Flying Club, third prize. In addition to cash prizes, a trophy is awarded each year to the club winning first place. Presentation of the trophy and prizes this year will be made at the annual aeronautical banquet of the N.A.A., Washington, D. C., July 23, in conjunction with the annual meeting.



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#### NEW NON-REFUELING ENDURANCE RECORD

Pilots Lees and Brossy Fly Packard-Diesel Bellanca for More Than Eighty-Four Hours and Thirty-Two Minutes at Jacksonville Beach, Fla.

NEW world's non-refueling endurance record was established on May 28 by Walter Lees and Frederick Brossy in a Bellanca Pacemaker type monoplane powered with a 225-horsepower Packard-Diesel engine. Their flight, made at Jacksonville Beach, Fla., regained for the United States the international record for endurance flying without refueling. After the barograph had been calibrated by the U. S. Bureau of Standards, the National Aeronautic Association certified the record to the Federation Aeronautique Internationale for approval and homolgation as eighty-four hours, thirtytwo minutes and thirty-eight and one-fifth seconds.

They took off on May 25 and continued flying until the early evening of May 28. when they had surpassed by several hours the world's record. Although there remained in the tanks sufficient fuel for several hours more of flying, they decided to terminate the flight rather than continue in the air until the fuel supply became ex-, hausted. This would have necessitated a landing after dark which the pilots desired to avoid. At the conclusion of their flight they had exceeded by nine hours and ten minutes the previous record held since March 1 by the French pilots Bossoutrot and Rossi. The fuel tanks contained thirteen gallons of fuel oil and four gallons of lubricating oil when the ship landed.

On the take-off, the gross weight of the plane was 6,715 pounds—weight empty, 2,350 pounds; useful load, 4,365 pounds, including the weight of 481 gallons of fuel oil and forty-one gallons of lubricating oil. With this loading, the take-off time was thirty-one seconds.

The monoplane used on the flight is in most respects a standard Bellanca Pacemaker. The seats and passenger furnishings were removed to provide space for fuel storage, and the span of the wings was extended to fifty-five feet. The wing area of the record Packard-Diesel Bellanca is 371 square feet. The bracing used is the external Bellanca type of lift-strut, designed to form effective lifting surfaces at higher angles of incidence.

The fuel was carried in two wing tanks, in five-gallon cans placed in the cabin and a sixty-gallon belly tank which hung below the fuselage. Fuel was first used from the later tank which, when empty, was dropped. The cans were used next, and thrown overboard when emptied, leaving the full fuel tanks in the wings.

The 225-horsepower Packard-Diesel has nine cylinders and weighs 520 pounds.

The horsepower used on the initial stages of the flight was 122 horsepower at 1,505 revolutions per minute. Fuel consumption in the first two hours averaged eleven and one-half gallons per hour. After eighty-whours of flying, the horsepower used was



Tires for wheels of the Sikorsky S-40 amphibion, each weighing 145.5 pounds

thirty-four at  $1{,}018$  revolutions per minute and the fuel consumption was 3.35 gallons per hour.

The flight represented the third attempt of Lees and Brossy to establish a new non-refueling record. On their first flight, a crack developed in the lubricating oil tanks, forcing them down after more than thirty hours of flying. On the second attempt, they had exceeded the American record by four-teen hours and were within two hours of a new world's record when a sudden storm forced them to descend out of sight of officials observing the flight, forfeiting official credit with the American record.

#### To Make Air Tour of Nation

AN air tour of the United States to promote general interest in aviation and encourage among state officials aid for emergency landing fields, was scheduled to be started June 29 by Dr. John D. Brock and Col. Ruby D. Garrett, both of Kansas City, Mo. They will visit state capitals and leading cities as official representatives of Kansas City and the States of Missouri and Kansas. Dr. Brock, who will withstand the principal expenses of the tour, recently completed his 577th consecutive daily flight. He is the sponsor of a campaign to establish landing fields and to air-mark towns throughout the Middle-West. Colonel Garrett is a war veteran and a prominent at-

#### AIRPLANE OUTPUT INCREASES IN FIRST QUARTER

D OMESTIC production of commercial and military airplanes in the first quarter of 1931 totaled 672, an increase of eighty-seven over production in the last quarter of 1930, according to a report issued recently by the Aeronautics Branch, U. S. Department of Commerce. The number of planes built for domestic civil use during the first quarter of this year was 342, an increase of eighty-nine over the number manufactured for that purpose in the last three months of 1930.

Records of the Aeronautics Branch show that the 342 airplanes manufactured for domestic civil use were built by 103 companies or individuals. Thirty manufacturers built 208 airplanes under fifty Approved Type Certificates. Ten planes were ap-

proved for license in accordance with the provisions of Group 2, which has been established for aircraft that are manufactured in limited numbers, and which provides for approval without an A. T. C.

#### Morgan Elected President of Curtiss-Wright Corporation

RICHARD F. HOYT, chairman of the board of directors of the Curtiss-Wright Corporation, recently announced the election of Thomas A. Morgan, president of North American Aviation Corporation, as president of the Curtiss-Wright Corporation

#### REPORT OF ESTIMATED AIRPLANE PRODUCTION FIRST THREE MONTHS 1931

Based on Department of Commerce Licenses, Identifications, Reports

| Monoplanes                                                                                                                    |                                                   |  |  |  |
|-------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|--|--|--|
| Open-Cockpit (landplane) One-place Two-place Three-place                                                                      | 55<br>93<br>4                                     |  |  |  |
| Total open                                                                                                                    | 152                                               |  |  |  |
| Cabin (landplane) One-place One-place Three-place Four-place Five-place Six-place Six-place Seven to ten-place Over ten-place | 2<br>11<br>4<br>30<br>2(a)<br>3<br>14(b)<br>11(c) |  |  |  |
| Total cabin                                                                                                                   | 77                                                |  |  |  |
| Miscellaneous Convertibles Amphibions Monoplanes for which data are not available                                             | 3<br>3(a)                                         |  |  |  |
| Total monoplanes236                                                                                                           |                                                   |  |  |  |
| Biplanes                                                                                                                      |                                                   |  |  |  |
| Open-Cockpit (landplane) One-place Two-place Three-place Four-place Five-place                                                | 5<br>36<br>40<br>5<br>1                           |  |  |  |
| Total open                                                                                                                    | 87                                                |  |  |  |
| Cabin (landplane)<br>Five-place                                                                                               | 5                                                 |  |  |  |
| Miscellaneous<br>Amphibions                                                                                                   | 3                                                 |  |  |  |
| Total biplanes                                                                                                                | 95                                                |  |  |  |
| Autogiros  Helicopter  Sequiplane  Military airplane deliveries 3  Airplanes exported (d)                                     | 9<br>1<br>1<br>02<br>28                           |  |  |  |
| Grand total6                                                                                                                  | 72                                                |  |  |  |

Note: (a) One multi-engined plane; (b) 8 multi-engined planes; (c) 11 multi-engined planes; (d) does not include planes listed in the above breakdown nor planes exported in 1931, which were manufactured prior to January 1, 1931.

JULY, 1931

#### FAMOUS FLIGHTS WITH THOMPSON VALVES



# When Maughan

RACED THE SUN ACROSS THE

# CONTINENT

Few flights have stirred the imaginations of their day like the epic "Dawn to Dusk" achievement of June 23, 1924, which made Lt. Russell L. Maughan of the United States Army the first man to flash across the North American continent under a single sun. Flying an army pursuit plane powered with a Curtiss D-12 engine, he took off from New York at daybreak, landing at Crissy Field, San Francisco, just as darkness was settling over the throng that had gathered to greet him. At his destination, as at every one of the five refueling stops, his motor was reported "working without a flaw." One reason for this was the fact that the all-important valves were Thompsons—"definitely eliminating," in the words of Curtiss' chief motor engineer, "any trouble from this source."

THOMPSON PRODUCTS, INCORPORATED

General Offices: Cleveland, Ohio, U.S. A.
Factories: CLEVELAND and DETROIT





Thompson Valves

#### DIGEST OF RECENT EVENTS

A Brief Chronological Summary of the Month's Important Aeronautical News

Canadian Record

(Canada.) Capt. John D. Parkinson reached an altitude of 22,000 feet on a flight at Montreal, exceeding by 2,000 feet the Canadian altitude record which he established two years ago. In a Curtiss-Reid biplane, he completed the ascent in fiftythree minutes. (May 26.)

#### Air Tour

Eleven aerial events were staged at each afternoon stop of the Midwest Air Race Tour of Northwest Kansas. The municipal airport at Concordia was dedicated at the completion of the tour, with tour pilots and planes participating in the dedicatory program. (May 26-31.)

#### World's Altitude Record

(Germany.) A new world's altitude record of 52,480 feet was established by Professor Auguste Piccard and Dr. Charles Kipfer in a hydrogen balloon with an airtight gondola of aluminum. Eighteen hours and thirteen minutes after taking off from Augsburg, Germany, they landed on a glacier above Ober Gurgl, Oetz Valley, in the Tyrolian Alps, swept there by varying winds across southern Europe. Their balloon was in good condition and the instruments with which they obtained data on the stratosphere were intact. The former record of 43,161 feet was established by Lieut. Appollo Soucek, USN. (May 27.)

#### N.A.C.A. Meeting

The largest wind tunnel in the world was dedicated at the Sixth Annual Meeting of the N. A. C. A., Langley Field, Va. (May 27.)

#### Captain Hawks

(France.) Capt. Frank M. Hawks, American pilot, flew back to Paris after having taken off there in the morning for breakfast in London, luncheon in Berlin. He covered the 1,400 miles in a flying time of seven hours and thirty-one minutes, averaging 182.2 miles per hour in his Travel Air biplane, Texaco 13. (May 27.)

#### Diesel Endurance Record

A new world's non-refueling endurance record of eighty-four hours and thirty-three minutes was established at Jacksonville Beach, Fla., by Walter Lees and Frederick Brossy in a Diesel-powered Bellanca monoplane. They exceeded the former record of seventy-five hours and twenty-three minutes held since March 1 by the French pilots Bossoutrot and Rossi, (May 28.)

#### Amelia Earhart Putnam

Beginning a westward coast-to-coast flight in an autogiro, Amelia Earhart Putnam took off from Newark Airport, accompanied by Eddie McVaugh, mechanic. (May 28.)

#### Coast-to-Coast in Autogiro

The first transcontinental flight in an autogiro was completed at San Diego, Calif., by John Miller. After taking off from Philadelphia, he made the flight across country in easy stages. (May 28.)

#### Aerial Anniversary

The First Anniversary of United Airport, Burbank, Calif., and the Second Annual Air Memorial Service of Aviation Post. Southern California Chapter of the American Legion, were observed at United Airport. (May 30.)

#### Airport Dedication

The dedicatory exercises of the municipal airport, Birmingham, Ala., were held. (May 30-June 1.)

#### Canadian Air Mail

(Canada.) The decision of Prime Minister Richard E. Bennett to cancel all air mail services in Canada at an early date because of heavy deficits in postal operations was announced at Ottawa. (May 31.)

#### Pilotless Plane Flown

A pilotless monoplane was successfully flown by radio control from another plane at the municipal airport, Houston, Texas. (May 31.)

#### Air Corps

The First Air Division of the Army Air Corps, organized for the purposes of the annual maneuvers, was disbanded at Washington, D. C., after two weeks of field exercises. (Tune 1.)

Army-Navy Conference The 1931 sessions of the annual Army-Navy Aircraft Standards Conference began at the Philadelphia Navy Yard. (June 1.)

#### Rocket Glider Flight

A flight in a glider propelled by a rocket was successfully completed by William G. Swan at Atlantic City, N. J. He covered a distance of approximately 1,000 feet and rose to a maximum height of more than 100 feet. (June 4.)

Trans-Atlantic Flight by Do.X (Fernando Noronha Island.) A flight of 1.685 miles from Cape Verde Islands was completed in thirteen hours and eighteen minutes by the German flying boat Do.X, en route on a trans-Atlantic flight to Brazil. (Tune 5.)

#### Over-Water Service

Regular air mail with passenger and express service was inaugurated between the Palm Beaches, Fla., and Bahama Island by the Roosevelt Flying Service. Using a sixplace amphibion, the schedule calls for one round-trip weekly. (June 5.)

#### World Seaplane Records

(France.) Lieutenants Paris and Gonord established new world's seaplane records for distance and continued flight over a circuit of 115 miles at Arcachon. They covered 3,230 miles in thirty-six hours, forty-eight minutes and forty-four seconds. (June 5.)

#### Australia-England

(England.) A new record of eleven days for a flight from Australia to England was completed at London by Charles W. A. Scott. (June 5.)

#### Do.X at Natal

(Brazil.) The flying boat Do.X landed at Natal on a 125-mile flight from Fernando Noronha Island, completing a crossing of the South Atlantic with fuel sufficient for two hours more of flying. The plane left Alten-rhein. Switzerland, November 5, 1930. (Time 5)

#### F. A. I. Meeting

(Roumania.) The meeting of the Federation Aeronautique Internationale was held at Bucharest. (June 6-14.)

#### Completes Autogiro Flight

Amelia Earhart Putnam landed at Los Angeles, Calif., on the last leg of a transcontinental flight from Newark, N. J., the first woman to complete a coast-to-coast flight in an autogiro, (June 8.)

#### Aviation Radio

Three-way radio telephone conversation between three planes in flight and a ground station at Wright Field, Dayton, Ohio, was maintained during tests of a new type of aviation radio set for use in commanding pursuit planes, the Air Corps announced. (Tune 8.)

#### Airship Los Angeles

An airplane in flight was hooked on to and later released from the airship Los Angeles during an all-night demonstration flight from Lakehurst, N. J. Apparatus comprising a special trapeze on the under side of the airship and hooks on top of the upper wing of the plane, was utilized in the experiment. An airplane has been similarly attached to this airship several times in secret training and twice before in public demonstrations. (June 9.)

#### New Distance Record

(France.) The French pilots Joseph Lebrix and Marcel Doret established a new world's closed circuit distance record of 10,500 kilometers (approximately 6,500 miles) on a flight of seventy hours and ten minutes, terminated at Marignane. The former record of 5,564.1 miles was established by the French pilots Anthoine Paillard and Jean Mermoz. (June 10.)

#### Wright Employees Honor Byrd

Rear Admiral Richard E. Byrd accepted at Boston a sundial as the gift of the employees of the Wright Aeronautical Corporation, which they made in commemoration of his North Pole, trans-Atlantic, and South Pole flights. (June 14.)

#### Aviation Country Club Meet

The annual air meet of the Aviation Country Club was held at Hicksville, L. I., N. Y. Eight scheduled competitive events were on the program. More than 500 members and guests attended. (June 14.)

JULY, 1931



WARNER Scarab Engines

S.A.E. Summer Meeting

Seven hundred members of the Society of Automotive Engineers attended the summer meeting at the Greenbrier Hotel, White Sulphur Springs, W. Va. Speakers at the aeronautical sessions included David S. Ingalls, Assistant Secretary of the Navy for Aeronautics. (June 14-19.)

London-Rome Return Record

(England)—A record flight from London to Rome and return was completed in a flying time of nine hours and forty-four minutes by Capt. Frank: M. Hawks in the Travel Air monoplane Texaco 13. Captain Hawks made the outward journey in four hours and forty-four minutes and the return flight in five hours flat. He figured his flying mileage roughly at between 1,850 and 1,890 miles, flown over at an average speed of from 191 to 195 miles per hour. Wing Commander Charles Kingsford-Smith previously held the record at more than ten hours (June 17.)

Completes Air Tour (Germany)—Margery Durant, American air enthusiast, landed at Baden Baden, completing a 7,000-mile air tour of England, France, Germany, Southern Europe and the Near East. She was accompanied by Charles La Jotte, pilot, and used a Lockheed Vega monoplane. (June 17.)

Canada-Mexico Flight

(Mexico)—James G. Hall completed a non-stop flight from Vancouver, B. C., to Agua Caliente, Mexico, in seven hours, forty-eight minutes and thirty-one seconds in a Lockheed-Altair monoplane. He exceeded the record of nine hours and fourteen minutes set last October by Col. Roscoe Turner. Hall did not carry a barograph and therefore the mark is unofficial. (June 18.)

Michigan Air Tour

Planes participating in the Third Annual Michigan Air Tour, sponsored by Grand Rapids, Mich., took off at Grand Rapids. (June 18.)

Graf Lands on Water

(Germany)—The Graf Zeppelin successfully landed on Lake Constance, taxied on the surface for over one mile and then took to the air again without the aid of a special crew other than the personnel of the airship. Equipment used in the experiment included tanks which were lowered and filled with water, two small air-tight gondolas and a sea anchor. June 19.)

Glider Flies Channel

(France)—A glider piloted by Lissant Beardsmore, a Canadian, flew across the English Channel from England to France. Towed by a powered plane, the craft took off from Lympne Airdrome, cut loose at an altitude of approximately 9,000 feet and glided the distance of more than thirty-five miles across the Channel to the St. Inglevert Field, Boulogne, in approximately one and one-half hours. (June 19.)

Baton Rouge Air Meet
An air meet was held at the Baton Rouge

An air meet was held at the Baton Rouge Parish Airport, Baton Rouge, La., in conjunction with the dedicatory ceremonies of the field, (June 20-21,)

Newfoundland-England Flight

(England) Wiley Post and Harold Gatty flew from Harbor Grace, Newfoundland, to Chester, England, in sixteen hours and seventeen minutes. On a 'round-the-world flight, they continued on to Berlin via Hanover. (June 24.)

Newfoundland-Germany Flight

(Germany)—Otto Hillig and Holgar Hoiriis completed a trans-Atlantic flight from Harbor Grace, Newfoundland, to Krefeld in thirty-four hours and six minutes, then took off for Bremen. (June 25.)

#### COMING AERONAUTICAL EVENTS

July 1-September 8. Trans-Canada Air Pageant from coast to coast, sponsored by Canadian Flying Clubs Association.

July 2-19. Light Plane Tour of Italy, starting and ending at Rome.

July 3-5. Fifth Annual Air Meet, Bennett Field, Binghamton, N. Y.

July 3-5. Air Meet, Beverly Airport, Beverly, Mass.

July 4-25. National Air Tour of 1931 for the Edsel B. Ford Reliability Trophy, starting and ending at Detroit, Mich.

July 4. Air Meet, Binghamton Airport, Binghamton, N. Y.

July 4-5. Second Annual Air Meet, Joliet, Ill.

July 4-5. Air Races, York, Neb.

July 4-5. Dedication of Santa Barbara Airports, Ltd., Carpenteria, Calif.

July 10-14. First Annual Aviation Country Clubs Seaplane Cruise along Atlantic Coast, starting at Glenn Curtiss Airport, North Beach, Queens, L. I., N. Y.

July 14. Dedication of municipal airport, Shreveport, La.
July 23-24. N. A. A. Annual Conven-

tion, Washington, D. C.
July 25. King's Cup Air Race around
England, starting and ending at Hes-

ton Airdrome.

July 25-26. Air Circus, Bishop Airport, Flint, Mich., sponsored by

Junior Chamber of Commerce.

July 25. Detroit Balloon Race for
Detroit News Trophy, Ford Airport, Dearborn, Mich.

July 31. Conference on Airworthiness Requirements for Aircraft,

auspices Aeronautics Branch, U. S. Department of Commerce, Washing, D. C.

August 1-2. Air Circus, Scotts Airport, Oroville, Wash.

August 1-2. Dedication of Galesburg Airport, Galesburg, Ill.

August 2-16. National Soaring Contest, Elmira, N. Y., auspices National Glider Association and Elmira Chamber of Commerce.

August 29. Dedication of municipal airport, New Haven, Conn.

August 29-September 7. National Air Races, Cleveland Airport, Cleveland, Ohio.

September 1-3. Twentieth National Aeronautic Meetings of S. A. E., Hotel Statler, Cleveland, Ohio.

September 11-13. Third Annual Sioux Falls Air Races, Sioux Falls, S. D.

September 12-13. Fiesta of the Air, Los Angeles Municipal Airport, Los Angeles, Calif., in conjunction with La Fiesta de Los Angeles.

September 12. Schneider Trophy Race over the Solent and Spithead course, Southampton, England.

October. International air mail conference, Brussels, Belgium.

November 10-12. Fall Transportation Meeting of the S. A. E., Washington, D. C.

#### NORTHEAST

To Dedicate New Haven Airport

DEDICATION of the municipal airport, New Haven, Conn., will be held August 29, according to a recent announcement of the Board of Airport Commissioners of the City of New Haven. Space at the airport will be set aside for the exhibition of aeronautical products by manufacturers and distributors. The program will include competitive events and aerial demonstrations. Prizes will be awarded the winners of the various contests, which will include balloon bursting, spot landing and bomb dropping. The field has a turfted surface of eighty-five acres and is provided with night landing and repair facilities.

R. I. Model Plane Meet Held

APPARENTLY a new world's record for endurance flying with model airplanes was set at the Rhode Island State Airport, Hillsgrove, R. I., on June 6 when Sheldon Salisbury of Providence won the tournament conducted by the Rhode Island Aviation League with a thirty-minute flight. This flight surpasses the flight made' last year by Arthur Sullivan of Washington by twelve minutes. Salisbury's plane was built in accordance with A. M. L. A. weight rules, which cal! for one ounce of weight to every fifty square inches of wing area.

The Governor Norman S. Case trophy, given for the best all-around outdoor flying, went to William Snow of Pawtucket, who took first place in the Wakefield event, a fuselage flying contest, and second place in the Stout outdoor fuselage event. The trophy is a permanent one, and each year's winner will have his name inscribed on it.

THE autogiro owned by the Standard Oil Company of New York recently visited a number of Maine cities during a tour of New York and New England which comprised visits to more than 400 communities.

A 250-ACRE commercial airport was recently developed one mile west of Presque Isle, Me. Rumways of 2,000 feet and 1,700 feet have been laid out. An eighty-foot by 100-foot hangar has been erected and servicing facilities installed.

THE 106-acre municipal airport at Waterville, Me, will have in addition to a sixplace hangar and airport equipment, a golf course, tennis courts and other conveniences. The landing field, one and one-half miles west of the city, has runways of 2,000 feet and 1.800 feet.

AN airport has been established three and one-half miles southeast of Sanford, Me., by the Sanford Airport Corporation. The officers of the company are: President, Stephen A. Cobb; treasurer, Rajh B. Emery; clerk, Lester H. Willard. The landing field has an east-west runway of 2,800 feet and a north-south runway of 2,200 feet, and is equipped with a sixty-foot by sixty-foot hangar, Rengir facilities are available.

A FLYING service owned and operated by Charles Steves, graduate of the Curtiss-Wright School, Rockland, Me., has been established at Calais, Me. For equipment he uses an OX-Commandaire training plane and a Challenger-Robin. He is instructing five students, using a field west of the town beside the highway.

#### Aviator's Orchestra Leader Believes Good

Musicians Make Good Pilots
THE Musical Aviators Orchestra recently adopted new insignia which illustrates
their theory that there is a definite connection between the rhythms of plane motors
and music.

"The theory," declares Tom Truesdale, leader of the orchestra, "is that a trained aviator will make a better musician than a man of equal musical talent, who knows nothing at all about flying. Conversely, and



Emblem of the Musical Aviators

for the benefit of those who employ pilots, I think it is absolutely true that a good musician will make an exceptionally good filer. I should even go further and advise the study of rhythm in all flying courses."

All of the eleven members of the Musical Aviators Orchestra are pilots and spend most of their spare time flying. They own a Great Lakes training plane operated on a flying club basis.

The orchestra started out last year as a headline attraction in vaudeville. They flew from city to city to keep engagements. Last winter they furnished music in the "Aviation" grill of a large New York hotel. They were broadcast over the largest radio network a total of 168 times, a record for dance orchestras.

MAINE STATES AIRWAYS, INC., has been reorganized with Jack Dodge as president and Everett Munsey as treasurer. They have purchased a Warner-Challenger training plane. Dodge is giving instruction in this ship at Augusta.

MAINE AIR TRANSPORT, Rockland, Me., has been doing a steadily increasing volume of business since beginning operations May 1 over its Rockland-Vinal Haven-North Haven-Stonington run. According to Bill Wincapaw, president of the company, more than 1,000 passengers were carried during the first five weeks. An attractive waiting room has been completed for the accommodation of passengers at the Rock-land base.

OFFICIAL opening of the Falmouth Municipal Airport, Falmouth, Mass., was held June 21. Improvements recently completed include a metal hangar, sixty feet by eighty feet, development of the landing area, and installation of new and enlarged servicing facilities.

MORE than sixty students have been reported enrolled by the Nassau Air Service Corporation, Curtiss Airport, Valley Stream, L. I., N. Y. A Waco Taper Wing was recently added to the flying equipment for the instruction of advanced flying students.

#### Rentschler Field in Connecticut Is Formally Opened

RENTSCHLER FIELD in East Hartford, Connecticut, a new airport belonging to the United Airports of Connecticut,
a subsidiary of the United Aircraft & Transport Corporation, was formally opened on
Sunday, May 24. Its opening coincided with
the visit of the United States Army Air
Corps which used the field as one of its bases
for operations over the New England States.

The field, named in honor of F. B. Rentschler, president of the United Aircraft and Transport Corporation, is located directly bheind the factories of Pratt & Whitney Aircraft Company and the Chance Vought Corporation in East Hartford, which companies will use it as a base for test flying and servicing and storage work. It includes 165 acres of grassed land. Two hangars have already been erected, for use of Pratt and Whitney company.



Rentschler Field showing two hangars recently built. (Left) factory of the Pratt and Whitney Aircraft Company, and (right) plant of the Chance Vought Corporation, East Hartford, Conn.

W. L. LEWIS has been elected executive vice president of the Chicago Pneumatic Tool Company, New York City, according to a recent announcement of H. A. Jackson, president. Mr. Lewis was formerly vice president in charge of finance.

#### Students to Study Airlines

A SIX WEEKS' vacation survey of air transport operations in eighteen Middle-West cities was recently started by more than twenty students of the Daniel Guggenheim School of Aeronautics, New You University. The survey is being made in cooperation with the National Air Transport division of United Air Lines. They will fly more than 10,000 miles over regular transport lines during the study.

#### Air Meet at Binghamton, N. Y.

AN AIR MEET will be held at the Binghamton Airport, Binghamton, N. Y., July 4. The program of events will include aerial exhibitions, competitions and maneuvers. The meet will be followed by the arrival on July 5 of the planes participating in the National Air Tour of 1931. The tour will make an over-night stop and depart the following day.

CAPTAIN FRANK T. COFFYN, one of the first six men taught to fly by the Wright brothers in 1910, recently started training as an autogiro pilot at Pitcairn Field, Willow Grove, Pa.

A new model portable belt sanding machine, designated the Type B-10 dustless take-about sander, was recently announced by the Porter-Cable-Hutchinson Corporation, Syracuse, N. Y. The apparatus has a vacuum system incorporated in its construction and differs radically in design from the other Types B-5, B-4 and B-44 developed by the company.

APPROVED Repair Station Certificate 47 has been awarded the Eastern Aeronautical Corporation, Newark Airport, N. J., by the Department of Commerce, according to a recent announcement of officials.

#### Chamberlin Organizes Flying Club

A flying club has been organized by the Chamberlin Flying Service, Jersey City, N. J., according to a recent announcement of Clarence D. Chamberlin, president. Membership in the club entitles each member to five hours of evening ground school work at the company's factory in Jersey City and five hours of field and flying instruction at the Jersey City Airport. The course is designed to permit the student to determine without too great expense whether or not he wishes to continue further and become a licensed pilot, and to give the average person a working knowledge of aviation.

A line of screw extractors, embodying patented features which make it possible to take out the end of a broken stud or bolt without removing or loosening other bolts, has been announced by the Jackman Tool



Aeromarine AR-3 aircraft engine

Company, Pittsburgh, Pa. The Jay Tee line includes drills, drill guides and extractors for bolts from one-quarter inch to three inches in diameter.

THE Aeromarine Plane & Motor Company, Keyport, N. J., recently announced the completion of a fifty-hour test run of the Aeromarine AR-3 aircraft powerplant under the supervision of the Bureau of Standards. The engine is a three-cylinder powerplant developing fifty horsepower at 2,100 revolutions per minute. The company plans to begin commercial production in August. A technical description of the Aeromarine AR-3 engine is scheduled to appear in an early issue of AEso Dtessr.

#### New Flying Club Organized

A flying club has been organized in Columbus, Ohio, to be known as the Junior, Inc., headed by Fred Gugle of Columbus. Port Columbus will be the base of the club's activities. A Curtiss-Wright Junior has been purchased for use of the club.

A FIVE-YEAR contract for the use of Port Bucyrus, Ohio, as a regulation station on its Chicago-Pittsburgh link in a transcontinental air passenger, express and mail line has been made with Miss Lauretta Schimmoler, port manager, by the Chicago & Eastern Airways.

#### Ohio Adopts New Air Code

THE new Ohio aeronautics code, which will become effective July 27, is unfavorable to owners of or persons building homemade airplanes. Although State Director Frank McKee has no authority to prevent any person from constructing a home-made airplane, the new code gives him authority to prosecute anyone without a pilot's license or a person flying a ship not properly licensed under the rules and regulations of the Aeronautics Branch, U. S. Department of Commerces.

HAROLD F. PITCAIRN was the honor guest at a recent banquet given at Philadelphia, Pa., by the Aero Club of Pennsylvania and the Aviation Committee of the

Chamber of Commerce,

Mr. Pitcairn and Geoffrey S. Childs of the Autogiro Company of America recently sailed for a three weeks' visit to England, where they will discuss plans and technical details of future autogiros with Juan de la Cierva, inventor.

IMPROVEMENTS at Somerton Airport, Pa., are steadily progressing. An extension has been made to the main hangar and, in addition to a golf-driving range at the field, a pony-riding circle has been installed to amuse the younger children.

RECENT glider flights made by Gus Haller, gliding champion, were successfully completed at the Pittsburgh-Greensburg Airport, Pa., altitudes over 200 feet being attained in a secondary glider. Haller is engaged in building sail-planes for advanced soaring.

#### Club to Buy New Plane

ACCORDING to an announcement of Theodore Elliott, treasurer of the BJJ Flying Club, the flying organization of employees of the BJJ Aircraft Corporation, Baltimore, Md., the members plan to buy an additional plane to supplement the initial ship with which the club started operations. Several different types of planes are under consideration and a definite selection is expected to be made in the near future.

THE FLEDGLING FLYING CLUB, INC., Baltimore, Md., has been organized for the purpose of operating a flying club. The incorporators are Richard E. Preece, R. E. Lee Young and Leon H. A. Pierson. Headquarters of the club will be at the Curtiss-Wright Airport, Baltimore.

### Developing Baltimore Airport The recently completed landing and take-

off runways at the Baltimore, Md., temporary municipal airport at Logan Field have been opened to traffic. The runways are each 2,200 feet long and 200 feet wide. One runs east and west and the other north and south. A number of improvements which have been completed at the field include the installation of a thirty-six-inch double-faced revolving beacon, a flashing beacon, and

# norton FIELD NOTES

[W. Donald Walter]

MAJOR H. C. KRESS MUEHLEN-BERG, Corps Area Air Officer, and Lieutenant A. R. McConnell, C. O., of Norton Field, Columbus, Ohio, have been at Bowman Field for duty in connection with Corps Area maneuvers. Norton Field pilots will be glad to see them home again, particularly since we shall be minus our only service type ship until they return, as Lieutenant McConnell has our O2H with him.

RESERVE PILOTS kept the Norton Field PT's busy over the week end of Memorial Day. Two formations were flown Saturday morning to scatter flowers over the local cemeteries. Individual flights kept

the four ships in the air all afternoon. Rain and poor visibility held the planes on the ground until late Sunday morning, but in spite of this late start, the average for each of the two days was approximately twenty hours. With the definite assignment to the field of a PT-3, which is being ferried here from San Antonio, and the rumor of another of the same type and of four Wasp-motored BT-2's in the near future, the last month of the fiscal year should be a full one for Reserve officers flying out of Norton Field.

#### SOUTHEAST

#### To Develop Commercial Airport at Atlanta, Ga.

PRELIMINARY surveying and engineering details have been completed and financial backing reported secured to the extent of more than one-half million dollars for the development of a commercial airport at Atlanta, Ga. Sponsors of the project, including a number of Atlanta business men, expected to have the actual construction under way by June 15.

Development of the first unit of 328 acres of a tract totaling 534 acres, is expected to be completed within a year, at a cost estimated at \$613,000, including the purchase of the land. The site selected, upon which options have been secured, is seven miles northeast of the center of Atlanta.

WORK will be started on the construction of a hangar on the airfield of the Fort Pierce Airways, Inc., Fort Pierce, Fla., according to a recent announcement of Capt. F. M. Upton, manager. The hangar will be of Spanish architecture and will accommodate twenty planes.

### Guggenheim School of Aeronautics Dedicated at Georgia Tech

DEDICATION of the Guggenheim School of Aeronautics was held June 8 at the Georgia School of Technology, Atlanta, Ga. The honorary degree of doctor of science was conferred on Harry F. Guggenheim, one of the founders of the Guggenheim Foundation through which Georgia Tech obtained its \$300,000 plant devoted to the study of aeronautics. A bust of Daniel Guggenheim was unveiled.

#### NORTH CENTRAL

THE Federal Radio Commission recently issued a permit to Aeronautical Radio, Inc., for construction of three short wave radio telephone and telegraph stations at the airports in St. Paul, Minn., and Fargo and Pembina, N. D. Aeronautical Radio, Inc., with headquarters in Washington, D. C., is owned by a group of the air mail transport operators.

Pilot Gets On-Time Flying Award HOMER S. COLE, air mail pilot for Northwest Airways, Inc., won the April award for the best on-time flying record of the company, with an average of ninetyeight per cent, Col. L. H. Brittin, vice president and general manager, announced recently. To win the award, Cole flew 7,000

miles over the Twin Cities-Chicago route and averaged seven stops on each round trip with only four tardy arrivals.

#### Special Air Taxi Rate Announced

A NEW special rate of one and one-half cents a pound will be charged for air taxi trips from Wold-Chamberlain Field, Minneapolis, Minn., by Universal Flying Service, it was announced recently. The minimum charge will be \$1.50.

AIR MAIL AND PASSENGER service between the Twin Cities and Duluth was recently inaugurated by the Northwest Airways, Inc. A twin-motored Sikorsky amphibion will make a round trip daily. C. R. French is the Duluth manager of the

A branch line to Bismark and Mandan. N. D., was also opened. The two new Hamiltons purchased for this run will be piloted by Carl F. Luethi and Lester Smith.

### Funds From Tax on Aviation Gasoline To be Used for Emergency Fields

EXPENDITURE of money received by the state from the tax on aviation gasoline to establish emergency landing fields is authorized by a state law passed by the Michigan legislature, recently adjourned.

Aerial surveys are being made of the northern part of the state in contemplation of constructing these emergency fields by the state board of aeronautics under the direction of Major Floyd Evans, state director of aeronautics. It is planned to have landing facilities available along the main lines of air travel at least every thirty miles.

WORK has begun on the new asphalt runways and concrete taxi aprons at the new Union Airport, Lincoln, Neb. The runways are to be 1,800 feet long, running east and west and from the northwest to the southeast. The hangar apron and the runways will be linked by the taxi aprons.

NIGHT short-trip passenger rides are being offered by the Lincoln Airplane & Flying School, Lincoln, Neb. Clifford Currier is the pilot in charge.

A CELEBRATION commemorating the landing of the first air mail plane at the Milwaukee County Airport, Wis., five years ago and dedicating the new \$33,000 hangar built at the airport by the county for the Northwest Airways was held at the airport June 7.

ARTICLES of organization have been filed by the Burlington Flying Club Inc., to operate an airplane business in Burlington, Wis., and instruct air pilots. The capital stock of the organization is \$2,500. Incor-

porators are William J. Leach, Russell Wilson, John Moore and Theodore A. Stang.

Madison Passes Air Ordinance AN ORDINANCE regulating the operation of aircraft flying over Madison, Wis., has been passed by the common council. No acrobatic flying will be permitted over the city. Planes must remain 1,000 feet above the ground. A fine of not less than \$5 nor more than \$100 is provided for each

THE AIRCRAFT OPERATORS' AS-SOCIATION, composed of Milwaukee, Wis., commercial plane operators, has voted to eliminate all stunt flying by their pilots. They will discourage the use of unlicensed airplanes in Wisconsin.

Edgewater Flying Club CAPTAIN E. A. DIXON has been ap-

pointed chief instructor of the Edgewater Flying Club, Inc., Chicago, Ill., succeeding Major J. C. Ryan. Captain Dixon will be in charge of all student instruction both at the air college in Chicago and at the flying field at the Chicago Municipal Airport, Joseph James and Ted Yeomans were recently added to the student instruction pilot staff.

APPOINTMENT of Charles W. Mc-Kinley as chief development engineer of the AC Spark Plug Company, Flint, Mich., was recently announced by H. H. Curtice, president and general manager. He succeeds Joseph Zubaty, resigned for an extended stay in Prague.

Air Races at York, Neb.
ARRANGEMENTS were recently completed for the air races to be held at the York Airport, York, Neb., July 4-5. Approximately \$1,500 in prizes to be awarded the winners of the competitive events has been posted, it was reported by the management. The races are sponsored by the Pioneer Aircraft Company, operators of the York Airport, and a group of Nebraska business men. James R. Ewing has been appointed manager of the races,

Mead Challenger Glider

DEVELOPMENT of the Mead "Challenger" was recently announced by Mead Gliders, Chicago, Ill. The craft is constructed of Sitka spruce throughout with plywood gussets, fabric covered. The release ring is located in the center of the instrument board. An instrument panel is provided directly under the cowling with adequate room for flight instruments.

Span with Rhon Ranger wings is 32 feet; length overall, 18 feet and weight, 152 pounds.



The Mead Challenger glider developed by Mead Gliders

#### SOUTH CENTRAL

Terminal Building at Lambert-St. Louis Field to Be Built

THE Municipal Airport Commission has approved plans for a terminal building at Lambert-St. Louis field, St. Louis, Mo. The \$152,000 required for the building will be taken from the funds remaining in the \$2,000,000 airport bond issue.

The building, to occupy a site on the west side of the airport, will be of Co-lonial architecture, two stories high, and surmounted by a glass inclosed control tower. The structure will be 198 feet long and of three widths, varying from thirty-seven feet to fifty-eight feet. The exterior finish will be brick.

Summer Season at Skyway Inn

SKYWAY INN, at Curtiss-Steinberg Field, St. Louis, Mo., opened the summer dancing season recently. There is dancing and night flying on Wednesday, Saturday, and Sunday evenings. Manager Eddie Grayson has obtained an orchestra for ground entertainment. Major C. Ray Wassall takes up passengers during intermissions, in a Ford trimotor at a penny a pound.

Set Light Plane Altitude Record

A RECORD of 15,000 feet, for planes weighing 500 pounds or less and carrying two passengers, was set recently at Curtiss-Steinberg Field, by Edna Rudolph and Thornton Wagner. The flight was made in a Curtiss Junior owned by the Valley Birdmen, a flying club. An official observer was present and the barograph carried was sent to Washington for calibration.

Sightseeing Flights by Parks

SIGHTSEEING flights on daily schedule, from Parks Airport, East St. Louis, III., to the Osage River power dam at Bagnell, Mo., are being arranged by Oliver Parks. The dam is attracting a number of visitors, and Parks believes that some of them would prefer to make the trip by air.

VICTOR ORR of Chillicothe, Mo., associated with L. F. Severance, recently completed arrangements for the opening of the Trenton Air Service, Trenton, Mo. They will offer flight instruction, ground school work and air taxi service.

#### Fairfax Airport

THE Fairfax Broadcasting Company of Fairfax Airport, Kansasa City, Mo., has purchased station WOQ from the Unity School, and has begun broadcasting by remote control from the Unity School building. As soon as a decision is made as to the location of the radio towers, the transmitter will be moved to Fairfax Airport.

The dining room and kitchen of the terminal building at Fairfax are being equipped for regular use, and will be operated by the airport company. Pre-

viously they had been used only for special occasions.

DAILY MILEAGE over Braniff Airways between Oklahoma City, Oklahoma, and Chicago, Ill., has more than doubled since opening of operations six months ago, according to Paul Braniff, manager. Five planes now cover 3,890 miles a day in twenty-six flying hours.

A RADIO BEAM SYSTEM will be installed at the new Oklahoma City Municipal Airport in July, according to William E. Fletcher, airport manager.

#### Develop Kansas City Airport

GRADING of an eighty-acre area on west side of the Kansas City, Mo, Municipal Airport will be the first improvement since the appropriation of \$500,000 was made available for airport purposes under the recent bond issue. The land to be graded will level the area between the west ends of the north-west-southeast and east-west runways.

Autogiro Demonstration in Oklahoma THOUSANDS of persons from Oklahoma City, Tulsa, Bartlesville, Muskogee and other sections of Oklahoma, as well as from Texas and Arkansas, were present at Fair Park, Oklahoma City, Okla, on June 14 to observe Amelia Earhart demonstrate the autogiro in its first appearance in this state. In connection with the demonstration, an air show was conducted with more than thirty planes participating.

AIR MAIL VOLUME handled in an eraged 581 pounds outbound and 555 pounds inbound weekly, according to Harold Halsell, president of the Oklahoma City air mail club.

SITES for the new Oklahoma City Municipal Airport hangars will be leased for \$1,000 a year for the first five years and \$1,500 a year thereafter, according to a decision reached by the city council recently.

#### Curtiss-Wright Field Available to Other Companies

OPENING of the Curtiss-Wright Flying Service field and hangars, northwest of Oklahoma City, to other companies, was announced June 6 by Bennett H. Griffin, assistant manager.

Heretofore, no commercial operator other than the company, was permitted to use the facilities of the field. Under the new policy, any aviation company, either private or public, will be granted free use of the field and operation accommodations.

Gasoline and oil for planes will be sold to operators at a reduction, and service work on planes will be made at low rates.

Passenger carrying at the field will be conducted at a standard price by all operators. The company's telephone service, waiting rooms, showers and lockers will be free to operators and customers. CONSTRUCTION ot a new operations building by the Army Air Corps at Hatbox Field, Muskogee, Okla, has been announced by Lieut. Roy Camblin, commandant of the field. It is expected to be started by July 1. The building will be of stucco and tile and will cost \$5,000.

THE new municipal airport, Gainesville, Okla, under supervision of the Department of Commerce, was officially dedicated in ceremonies at sunset May 27 when the 2,000,000-candlepower beacon and boundary lights were turned on for the first time.

Baton Rouge Parish Air Meet and Airport Dedication

A two-day air meet was to be held June 20-21 in conjunction with the dedication of the Baton Rouge Parish Airport, Baton Rouge, La. Scheduled on the program were airplane speed contests, aerobatics, demonstrations and exhibitions by pilots of the Army Air Corps and the Naval Air Service. Special trophies and a total of \$2,650 in prizes were to be awarded the winners of the various contests scheduled. A total of thirty-four events were listed on the program, including the following: Dead stick landing, parachute drops, sportsman pilot race, amphibion novelty races, speed races open to women pilots only, and a free-forall speed contest. Lewis Sevier was race director

#### Fly Pilotless Airplane

A PILOTLESS monoplane was flown successfully by radio control from another plane at the municipal airport, Houston, Texas, May 31. Approximately 5,000 persons watched the demonstration. Robert E. Audrey of Los Angeles, inventor of the devices used, announced that the results were satisfactory.

# CONTACTS By F. E. SAMUELS

Notes on a Tour of California Airports

ON a recent trip through California, I was agreeably surprised to see the many improvements that have been made in the airports along the route, and the growth of the business of the air transport lines operating from or making a point of call at

many of these airports.

SANTA BARBARA AIRPORTS LTD., at Carpenteria, Calif., our first stop, has a new frame and stucco ten-ship capacity hangar. The entire field has been graded, two runways oiled and all obstructions bordering the field removed. W. G. Smith Jr., is manager.

About six miles north is the Goleta Airport, a commercial field with long, well kept runways. There are emergency fields only for the next seventy-one miles to the Hancock Foundation College of Aeronautics, Santa Maria. Improvements are being made continuously at this semi-military college.

Thirty-one miles north is the San Luis Obispo Airport where many improvements are being made. One hundred and twentyseven miles north, with emergency or small commercial fields at Paso Robles, King City and Salinas, is an American Legion Post airport.

Twenty-one miles northwest to Watsonville is one of the finest airports between Los Angeles and San Francisco. C. R. Wilson is the port manager and has the Agency for Bird and Eaglerock planes.

TWENTY-TWO miles east and north across a mountain pass to San Jose is the up-to-date airport of the Mead and Orr Flying Service. Eighteen miles north is the Palo Alto Airport. From here it is five miles to Sanders Field, Redwood City. Along the Bay Shore Highway, ten miles north, is Mills Field, San Francisco's municipal airport, Capt. Roy N. Francis is manager. Many improvements have been made at this airport during the past year.

Across the bay at Alameda is the San Francisco Bay Airdrome, with conveniences and facilities for air transport lines, close to San Francisco, Alameda and Oakland, making it an ideal passenger station for air travelers.

Just a short distance along the coast is the Alameda Airport, a Curtiss-Wright Flying Service port. Connected with the airport is the new yacht harbor, nearly completed. A few miles further is the Oakland Municipal Airport. The five large hangars at the port are filled.

#### SOUTHWEST

#### Northrop Alpha Sales

ORDER for six Northrop Alpha transports from Transcontinental & Western Air, Inc., to be delivered by July, was recently reported by officials of the Northrop Aircraft Corporation, Burbank, Calif. This is equipment in addition to the first order placed by this company for five Alpha transports. The planes included in the original order have been in service for more than two months.

National Air Transport has purchased a Northrop Alpha which was delivered the first week in June.

Plans for dealerships in the new Northrop Beta are being considered by the Northrop company.

#### Santa Barbara Airports

DEDICATORY program of Santa Barbara Airports, Ltd., Carpinteria, Calif., to be held July 4-5, will include competitive aerial events and aerial demonstrations, according to a recent announcement of the management. Cash prizes and trophies will be awarded. Free passenger carrying privileges will prevail throughout the two days. The plane coming the longest distance to participate will receive an award of \$75. The autogiro owned and operated by the company will be demonstrated.

Ryan to Instruct in Blind Flying AFTER studying a series of blind flying tests conducted recently by the U. S. Department of Commerce, T. Claude Ryan, head of the Government approved transport Ryan Flying School in San Diego, Calif., has announced that he will include blind flight instruction with all transport courses.

OFFICERS and directors of the Kinner Airplane & Motor Corporation, Glendale, Calif., were recently elected at the annual meeting of stockholders. The officers of the company are as follows: Robert Porter, president; B. L. Graves, vice president, and Roy D. Bayly, secretary-treasurer. The following directors were elected: W. B. Kinner, Robert Porter, Roy D. Bayly, B. L. Graves, A. G. Davenport, W. Morris and Preston Lockwood.

On June 1 the company reported orders on its books for 413 engines. The number of engines sold and delivered for the first five months of 1931 totaled 135 as compared with eighty-two engines for the same period in 1930.

#### San Diego Aviation Week

UNDER the sponsorship of the chamber of commerce, aviation week at San Diego, Calif., was officially opened at Ryan Airport on May 24 with an aerial circus. Special activities continued throughout the week and were climaxed with the dedication ceremonies of the new Boeing hangar.

#### Air Ferry Night Service

PREPARATIONS for a night service on the Air Ferries Ltd., six-minute flight across San Francisco bay are now under way.

Tests are being made of various types of equipment to light the landing area at Pier 5, San Francisco. The San Francisco Bay Airdrome in Alameda, terminal of the daylight service, is to be the terminal for the night run.

TAKING OFF from Alameda, Calif., airport, Capt. John MacReady, aviation director of the Shell Oil Company, recently made a flight from over Mount Whitney to Death Valley, in twenty-eight minutes and thirty seconds. The airline distance is eighty-five miles. Mt. Whitney's altitude is 14,501 feet. Death Valley is 276 feet below sea level.

#### Operations at Oakland Airport

AIRPLANE operations at Oakland Municipal Airport during May were recently reported as follows by the Board of Port Commissioners: Landings, other than student, 2,101; student landings, 6,008; transport planes inbound, 211, outbound, 216; transient planes inbound, 224, outbound, 222; transport passengers inbound, 226; transient passengers inbound, 228, outbound, 223; taxi, 1,948; total passengers, 2,856. Students enrolled, totaled 367.

#### Passenger and Freight Service

PASSENGER and freight service between San Francisco Bay Airdrome in Alameda and Clear Lake, Northern California vacation area, has been inaugurated by Lucerne Airways, Ltd. William Hoffman is chief pilot.

The flight requires forty-five minutes as compared with land travel time of nearly four hours.

#### Antelope Island for Air Parties

ANTELOPE ISLAND in Great Salt Lake near Salt Lake City, Utah, is becoming popular with air sportsman. The Utah Air Travel Club recently held an outing on the island. Planes of Utah Pacific Airways, Inc., Ogden Airport, flew members of the club on the excursion trip.

#### NORTHWEST

#### Pacific Northwest States Air Tour

A FLEET of more than fifty planes was expected to take off June 27 at Vancouver, Wash., on the Pacific Northwest States Air Tour to visit fifteen cities in Oregon, Washington and Idaho, according to tour officials. Aerial exhibitions and demonstrations will be made at the various stops on the tour.

Major Howard C. French, Commanding Officer of the 321st Observation Squadron, U. S. Army Air Corps Reserve, has been appointed chief of operations for the tour. Major French directed the tour last year. The rules of the tour were made with the primary purpose of providing maximum safety for pilots, passengers and planes, Major French announced. Mechanics accompanying the tour will check all engines and airplane parts.

The program of the tour includes formation flying, aerobatics, parachute drops, passenger hopping, fire works display at all night stops and the inspection of planes by spectators. Passengers on the tour will be carried at night at airports which are equipped with adequate lighting facilities.

Russell H. Lawson is tour manager.

#### New Air Companies

CAPITALIZED at \$10,000, the Safeway Air Service has been incorporated at Spokane, Wash., by H. S. Hawley and C. E. Haynes.

Capitalized at \$10,000, the Cle Elum Roslyn Airport Company was recently incorporated at Cle Elum, Wash. Incorporators are H. H. Alexander, H. N. Gillett, Francis Cox, Glenn Stickler and P. Padavich.

A NEW \$18,000 building for the airport, Spokane, Wash, is to be provided by a recent appropriation. Plans are being made for a building of re-enforced concrete, with space for administration offices, comfort station, depot and quarters for weather bureau station.

ILWACO, Wash., is soon to have its first real permanent airport, inasmuch as grading and improving operations are mow underway by the recently appointed contractors. Located on the bay, the airport is open to seaplanes, flying boats and landplanes.

#### Westinghouse Motor

PUBLICATION of Leaflet 20385-A, Type CS Squirrel Cage Induction Motors. has been announced by the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. The leaflet describes the new W-frame motor which has interchangeable mechanical and electrical parts. Some of the modifications and special applications of these motors made possible by the interchangeability of parts are described and illustrated.

#### Curtiss and Wright Engines

THE International Nickel Company, New York City, has prepared a booklet, "The Curtiss and Wright Engines and Their Use of Nickel Alloy Steels." The booklet is devoted to the principal features and service records of the complete lines of Curtiss and Wright aircraft engines with special attention to the materials used in their construction. Illustrations are included showing views of the various engine models, of the more important parts and of planes in which these engines are installed.

#### Stanavo Pilot's Handbook

STANAVO Pilot's Handbook, 1931 edition, has been prepared by Stanavo Specification Board, Inc., as a useful and practical handbook for the convenience of pilots. Most of the data included in the contents represent suggestions received from pilots using previous editions, and includes information on weather reports, Government and commercial airline radio facilities, airline maps, detailed data chart for all American aircraft engines. oil viscosity and pressure recommendation and several practical conversion tables and charts.

Free distribution is being made to all pilots listed on the Department of Commerce records. Any pilot not receiving a copy by Tune 15 has been requested to communicate with the Board, 26 Broadway, New York City.

#### U. S. S. Stainless Steels

A TREATISE on U. S. S. stainless and heat resisting steels has been prepared under the direction of the subsidiary manufacturing companies of the United States Steel Corporation and published in booket form. The line of steels available as finished or semifinished products is described. These alloys, of relatively low carbon type, are classified under two main headings; chromium alloy steels (magnetic) and chromium-nickel alloy steels (non-magnetic). Differing in chemical composition, the types and grades obtainable in each of these classes are discussed particularly as to requirements in various specific applications.

#### U. A. T. C. Air Map and Log A folder containing a map and air log

of the 2,030-mile flight on the Chicago-San Francisco division of U. A. T. C.'s New York-San Francisco coast-to-coast service was recently issued. The routes of the Boeing and Pacific Air Transport divisions. connecting airlines, airports, auxiliary fields and beacons are indicated.

#### TRADE LITERATURE

NEW PAMPHLETS AND BOOKS OF INTEREST TO THE AERONAUTICAL INDUSTRY

#### Wilco Thermometals

TO SUPPLY information on the properties and uses of Wilco Thermometals, the H. A. Wilson Company, Newark, N. J., has prepared a booklet, especially for the attention of engineers, research personnel and production managers. The contents contain discussions of the four types of Wilco thermostatic metals available at present: standard, highflex, H.T. constant and high-

#### Goggle Price List

NEW retail list prices of aviator goggles have been published in a pamphlet by Strauss & Buegeleisen, Brooklyn, N. Y. The new and old prices of goggles produced by the company are given. The cost of each model has been reduced by the company.

#### Raycon Products

LOUD-SPEAKING equipment for indoor or outdoor installation, especially at airports. is described and illustrated in several leaflets prepared by the Raycon Electric Company. Inc., New York City. Complete equipment and various units with descriptive matter are presented. The leaflets are perforated for a loose-leaf cover.

#### A.C.A. Instruction Card

A CARD for metal workers, giving instructions for welding aluminum, has been prepared by the Aluminum Company of America, Pittsburgh, Pa. The card is so designed that it may be hung in the shop or factory for ready reference.

#### Colas Airport Surfacing

A CIRCULAR, "Airport Service," de-scribing the uses of Colas for airport surfacing, has been prepared by Colas Roads, Inc., New York City. Photographs of hangar runways and runways of Colas at various airports illustrate the text. Colas is an emulsion of pure asphalt and is applied cold.

#### Pioneer Test Equipment

A LOOSE-LEAF booklet with cardboard cover, "Pioneer Instrument Test Equipment," was published recently by the Pioneer Instrument Company, Brooklyn, N. Y. Pioneer instruments designed for testing the calibration of various aircraft instruments are described and illustrated. The purpose of each instrument is explained, the various parts of each apparatus as well as their functions are described and directions are given for the tests for which each instrument is designed. Test instruments for laboratory use and portable apparatus are included.

#### Research Service for Industry

THE research services available through the Department of Engineering Research at the University of Michigan, and the conditions under which these services are made available, are described in a booklet recently published by the university. Inquiries are to be addressed to the Director of the department, University of Michigan, Ann Arbor, Mich.

Chicago Rotary Drill
THE new CP No. 99-C rotary drill developed by the Chicago Pneumatic Tool Company, New York City, is described and illustrated in a circular prepared by the company. This is one of the line of pneumatic tools employing the rotary principle, being produced by the company.

#### Testing Auto Motors

A booklet describing the G. E. motor tester for automobile engines, "How to Diagnose Motor Troubles," has been prepared by the Garage Equipment Company, Los Angeles, Calif.

Perforated Pipe

FOR those concerned with the selection, installation and maintenance of drainage structures for airports and other large fields, highways and railroads, the Armco Culvert Manufacturers Association, Middletown, Ohio, has prepared a catalog describing Armco perforated pipe, designed for high subdrainage efficiency. Typical uses and details of construction of this product are described and illustrated.

AVIATION engine mechanics and others interested in aircraft powerplants will find Training Manual No. 2170-13, entitled "The Airplane Engine Mechanic," particularly helpful to them, according to a recent Air Corps announcement. The manual comprises 248 pages, contains illustrations and diagrams and discusses thirty-two subjects in connection with the care, operation, repair and maintenance of airplane engines, both air-cooled and water-cooled types.

The manual may be obtained for eighty cents from the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C.

A N effective light for marking obstacles and for guiding airplanes has been developed by the Westinghouse Electric and Manufacturing Company. These markers are composed of six U-shaped Neon tubes. The tubes are connected in series, but should one or more become defective, it is cut out of the circuit by an automatic cutout. The marker will remain in service as long as one active tube is left.

These markers have pedestal type mountings that may be bolted securely to any solid support. For operation on low voltages, a transformer is mounted under the hood.

FOR the first time in ocean navigation the funnels of an ocean liner will be floodlighted at night as an extra measure of safety. Rising sixty-eight feet above the sports deck of the new Canadian Pacific liner Empress of Britain three flood-lighted stacks will be visible for thirty miles at sea, and will be seen for more than an hour before the ship herself comes in view.

JULY, 1931

# SAFE



# for any pilot to fly

E set out to build an airplane which was beautiful . . . well built . . . a performer. Yet none of these qualities were to be given preference over safety.

We know the States Super Monoplane is beautiful, because the thousands who examined it at the Detroit Air Show told us it was the best looking plane of its kind on display.

We know it is well built, too, for our factory is equipped with the latest of precision tool machinery and the finest of aircraft materials; our inspection system is the most rigid; and the experience of our engineers dates as far back as 1910.

We know that the States Super Monoplane is a performer. We have flown it, under normal conditions, 105 m.p.h. wide open. It cruises at 90 and lands at 35. We have climbed it 900 feet per minute and have taken it to 14,000 feet altitude. Repeatedly, it has taken off in 200 feet fully loaded.

Inherently stable, the States Super Monoplane is safe for any pilot to fly. With our own pilot in the front cockpit we have permitted newly licensed fliers to test our plane so that we might observe how it handled with a novice at the controls. The reports have always been the same, "A dandy! Nice take-off, steady on the turns, hard to stall, spin-proof, quick to right itself from almost any attitude, a cinch to land." And so on.

Our original plan was to build the best two place open cockpit plane on the market. We honestly believe the States Super Monoplane is just that.

Dealers will find this an easy ship to sell. Write for our protected territorial assignments, factory co-operation and other franchise details.

Approved Type Certificate No. 349

# STATES AIRCRAFT CORPORATION 1632 WENTWORTH AVENUE CHICAGO HEIGHTS, ILLINOIS







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HAROLD "BUDD" FISHER

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First transcontinental air mail pilot. Flying
for fifteen years. Army test pilot. Over
4,000 hours in the air.

FRANCES HARRELL
In Charge of Women Students

In Charge of Women Students
Former stunt flyer and instructor of long
experience.

C. O. BEDFORD

In Charge of Ground School
Ground School Officer, U. S. Air Services,
World War. In charge of largest Army air
school in the world, the St. Paul School of,
Aviation. Associated with various aviation
organizations. Instructor of Aerodynamics
at New York University.

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(FLYING SCHOOL DIVISION)
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The Nassau Air Service Corporation conducts a passenger service at moderate rates; also a "Fly-Yourself-Service" for licensed pilots.

····HOTELS



FOR SALE

#### For Sale at Low Prices

14 Curtiss OX5's. II 150 horsepower Hispano-Suizas, 4 180 horsepower Hispano-Suizas, I Siemens-Halske. Also an American Eagle airplane, Modol AI, which has been used about one year. Our low prices will move this material fast. Act at one If you are interested. We will be pleased to send complete details on request.

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#### METEOROLOGY

As Related to the Operation of Aircraft

By HAROLD LOUIS KIRBY

RESULTS of a survey conducted by the author with the cöoperation of Air Corps and Naval Air Force officers, and of a study of the practical operation of aircraft under adverse weather conditions, are contained in this book. A thorough study was made of meteorological conditions with special regard to the effect of these conditions upon pilots, aircraft and aircraft instruments. The book presents all essential information, technically correct, and in such terminology as can be readily understood. Full instructions are given in the use of meteorological instruments and data, weather reports and bulletins.

The volume was prepared especially for the use of the U. S. Army Air Corps Reserve, U. S. Naval Reserve Air Force, applicants for Department of Commerce pilot licenses, aircraft operations managers and commercial pilots.

#### NEW AERONAUTICAL BOOKS

WINGS OF TOMORROW
By Juan de la Cierva and Don Rose

POR nearly four years Don Rose has been writing regularly for Arro Diorser. As one of the authors of Wings of Tomorrow:

The Story of the Autogiro, he needs no introduction to readers of this magazine. The other is the inventor himself, Juan de la Cierva, who twice visited this country and discussed his experiences and theories at length with his American collaborator. They have produced a book of three hundred pages which tells the whole story.

Here is Cierva's history as a youthful designer in conventional aeronautics, whose early efforts came to a bad end but led to something better. The book devotes two chapters to the process of reasoning which led to the principle of the autogiro, presenting at the same time a lucid explanation of the principles of flight and making even autorotation seem simple. The development of the 'windmill' craft is covered, illustrated with photographs, and carried down to date.

The chapters that discuss the prospective uses of the autogiro are actually a survey of the net worth of aviation at the end of its first quarter century. They are written calmly, judiciously and with the joint authority of an experienced engineer and a practiced observer of aviation's affairs for the past ten years. They review everything under the areonautical sum—the airport problem, air mail possibilities, the need for a "family flying machine," the plight of the student pilot, the reasons for crack-ups, the future of flight and the uses of aircraft for business and pleasure.

Pilot Jim Ray wrote Chapter 21 and tells you how to fly the autogiro. Another chapter is frankly for the technician and engineer. Another tells what the experts of the industry think of the new craft. The chapter on "The Wings of Tomorrow" is a valuable contribution to perspective, proportion and good sense in looking ahead to the real air age of the near future.

Don Rose usually likes to write flippantly and even merrily about aviation, and assumes a disarming air of ignorance concerning its more technical considerations. But in this book he has done a job of genuine literary value. Very few aeronautical

books have been so well written, and the result is that this one is thoroughly readable. It is thoroughly reliable, for its facts and statements have been carefully checked by the inventor of the autogiro and his American partners in its development. This is the first book on the autogiro ever published and the job has been well done, without excitement or extravagance but with a decent respect for the facts in the case and the best interests of aviation.

The book includes about thirty pages of photographs and drawings, including those of the early "ugly ducklings" which would not fly, and pictures of famous pilots at the controls of the windmill plane.

#### PILOT'S HANDBOOK

THE Pilot's Handbook of 1931 is a composite handbook and reference guide for those engaged in aeronautics. It is prepared to give in one volume, pertinent, complete and readily accessible information. The book is intended not only for pilots but for those responsible for the construction, organization and operation of aircraft and airlines.

The contents include a complete compilation of the regulations of the Aeronautics Branch of the U. S. Department of Commerce, a list of the airports and emergency landing fields in the United States and an up-to-date buyers' guide for the aviation industry.

As a compendium of information to complement the pilot's knowledge at any and at all times in navigational problems, the book includes a folder which contains twenty-one sectional flight service maps of the United States. To serve a two-fold purpose of orientation and navigation, these maps were constructed under the direction of the publishers on a Mercator projection, the first time in cartographic history that sectional maps have been made avilable to the pilot on this projection.

Complete text on aerial navigation is presented. Prepared by Lieut. Comdr. P. V. H. Weems and his collaborators, this text comprises the complete Weems System of Aerial Navigation which dispenses with higher mathematics. The science of navigation is presented in non-technical, easily comprehensible terms.

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# New Improved Champion Spark Plugs for Aviation

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# STOUT "SKY CAR" MODEL

OW many times model builders are confronted with the question "Why do you build model airplanes?" or "Of what use is model building?" It is annoying enough for such questions to be suddenly asked of a boy who is just simply following his hobby, but in many cases the questioner seems to feel that by this challenge a young man will be brought to his senses and mend his ways, so to speak. In other words, the attitude is one of a self-appointed reformer. Even in our aeronautical circles one frequently encounters such situations.

On the contrary, model aviation is a fascinating sport, an absorbing study, and a hobby second to none. It even has a scientific aspect which is perhaps unfamiliar to many who have built models.

If we look back into the history of mechanical flight we find many examples of model building by early experimenters. Such names as Caley, Stringfellow, Penaud, Langley, Lilienthal, Weiss, Chanute, Gallaudet, and the Wright brothers are insenarably connected with the development of aviation, and all experimented with models. More recently we have such designers as Fokker, Bellanca, Roche, Laird, Palhan, Cierva, and a great technical group in Germany vouching for the usefulness of free flight models for determining certain things in airplane design. Indeed, as mentioned in a previous article, Senor de la Cierva first demonstrated autogiro flight with a rubber-driven model

If the model airplane had nothing to justify its existence except its value in training the hand and the mind, it would be sugficient. But here is evidence of its use by a

# An Interesting Model for Flight Research

By R. E. DOWD

host of pioneer experimenters and successful designers. So the next time we are questioned about our hobby, let's lay down a verbal barrage of facts which will silence, if not convert, such uniformed individuals.

This discussion is timely, for we have selected for our July model a scientific miniature of a plane which was first publicly shown at the Detroit Aircraft Show in April. It was technically described in the April issue of Aero Digest. Its designer is Mr. William B. Stout, best known, perhaps. for his development work in connection with the Ford tri-motored transport plane. Mr. Stout is a model enthusiast. It was he who encouraged Mr. Merrill Hamburg to undertake the leadership of the A. M. L. A. Not only does he believe in models but he uses them in his work. The following is an extract from his recent letter to our Editor. Mr. George McLaughlin:

"The model is 37½ inches in span, weighs complete less than one ounce and has been of considerable usefulness in getting some qualitative information on balance, glider characteristics, etc.

"The model has been used in still air for

such tests and for an impression of stability, proper side areas, control sizes, effect on dihedral and fin area in side slips, and effect of control with surfaces set at different angles; also fore-and-aft balance for gliding without hunting and such types of tests where scale effect is not too important a factor. We believe there is even a possibility of developing such models to determine ease of recovery from side slips, spin characteristics, flight spin tendency, etc."

We must note that Mr. Stout specifically refers to "qualitative information" and that the model was used "for such type of tests where scale effect is not too important a factor." It would be as great a fallacy to pattern a transport plane, for example, after some freakish but successful paper glider as it is to believe the model has no importance in research work whatsoever. Mr. Stout knows this, and so do the others who utilize models in flight tests.

In Germany the Rhön-Rosithen Gesell-schaft makes extensive use of model gliders. Experience has taught them that if a span of about one-quarter size (12 to 15 feet) is used, that the actual wing loadings of the full size machines can be employed. Also actual quantitative information can be obtained from free flight tests. Flight durations of as great as five minutes have been attained with quarter-size pitoless gliders.

Without dwelling further on this interesting subject, let us turn to the Stout "Sty Car" as created from Mr. Stout's large machine by Aram Abgarian, former world's champion model builder. Mr. Abgarian is now in the Engineering Department of the Stout Engineering Laboratories of Dearborn, Michigna. His model experience has





Views showing skeleton framework and finished flying model of the Stout "Sky Car"

been excellent training for his professional aeronautical career, which is, of course, just starting at the present time.

In discussing the proposition with Mr. Agarian we learned that the model herein described was quite complicated, due to the necessity of following the scale and general design closely. He doubts that many boys will take the time to make such a model, but we are sure all will be interested to learn about its details. For this purpose, Mr. Abgarian has given us the following description of its various units.

#### The Wing

A modified M-12 double-cambered wing section has been used. The tip section has been thinned down somewhat from the center section but both have the same general characteristics. For instance, the maximum ordinate or thickness is found in both at 30% from the leading edge. In the center section this is in per cent of the chord 10,93 above the datum line, and 7.09 below. In the tip it is 9.76 above and 6.2 below.

"The picture of the wing construction should be self-explanatory. A hollow balsa leading edge was used and care was taken to have an extremely light construction. Rib and spars were of balsa and were lightened as much as possible. The trailing edge of the wing was made of bamboo. The wing covering was ordinary Jap tissue with two applications of acetone as a shrinking medium.

#### The Cabin

"Here again the photograph explains the construction. Balsa bulkheads were used with bamboo strips to maintain the proper contour. The wing was set into place and the top of the cabin faired into the leading edge of the wing.

#### The Landing Gear

"For the landing gear, two streamlined

shock struts were used with bamboo axle and brace strut. A piece of .025 music wire served as a bearing for the wheels, which were of solid balsa.

#### The Tail Outrigger

"This was constructed entirely of balsa rounded down to the correct diameter. The drawing takes care of the necessary details of construction.

#### The Empennage

"The tail surfaces were built up the same as the wing. Bamboo was used for the outer edges with balsa ribs and spars. It is advisable to use hinged surfaces as some adjustment will be needed on the flying model. The airfoil used in the tail group was N. A., C. A. M-2."

#### The Motor Unit

Bamboo struts as indicated in the drawing serve to support the ¾-inch diameter balsa tube, which houses the rubber motor. The winding is done from the front end by withdrawing the streamline end plug, which anchors the motor. The propeller is of balsa and is made as large as the outrigger construction will permit. The addition of any type of power plant on a model of this type is quite an inconvenience, but this particular unit worked satisfactorily, although the durations were very limited.

#### General Points

It is of interest to check the location of the D.C. or directional center with the C.G. or center of gravity, particularly because this is a scale model of a large machine. Both these centers are indicated approximately on the drawing and we find that the distance between them is .022 times the sum of span plus the length. It will be recalled that our model factors have ranged from .025 to .050. This is therefore not dissimilar to standard model practice, although the machine is very unusual in appearance and general design.

In the light of German research practice with models, we are led to believe that a properly ballasted one-quarter size model of the "Sky Car" could be used in hilly terrain to obtain actual quantitative data. In other words, it would have been possible to check the gliding angle under various loads and tail

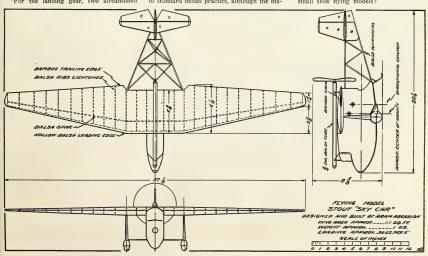
of the complete machine could have been obtained. This would enable the designer to calculate power performance since the drag would be known. Furthermore, the behavior in gusty or disturbed air could be checked and valuable stability refinements worked out. In the absence of hills it would be possible to tow such a model to an elevation over level ground and to check its performance after releasing.

settings. In this manner the

As mentioned before, the "Sky Car" makes an excellent object for study as to what can be done by an expert builder. It is not so very practical as a design for the builder of limited experience, and we therefore suggest that its greatest value to our average reader will be in showing him how such creations are pressed into service for research work.

Let us therefore review some of the high spots as follows:

- Name seven pioneers who used flying models for research.
- Name four modern designers who have used flying models in their experimental work.
- What German technical group makes a regular practice of testing flying models of new glider designs?
- 4. What is the difference between qualitative and quantitative results?
- 5. Which of these may be obtained from small slow flying models?



### FOREIGN NEWS IN BRIEF

Compiled from reports from AERO DIGEST correspondents and the Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce.

#### **GERMANY**

Set New World's Altitude Record of 52,480 Feet in Hydrogen Balloon

A WORLD'S altitude record of \$2,480 feet was established May 27 by Professor Auguste Piccard and Dr. Charles Kipfer in a hydrogen balloon with a spherical air-tight gondola of aluminum. They took off from Augsburg, Germany, and landed on top of a glacier above Ober Gurgl, Oetz Valley, Tyrol, after eighteen hours and thirteen minutes in the air, swept there by varying wind currents across many parts of southern Europe.

They had planned to stay aloft for approximately seven hours and carried oxygen sufficient for more than ten hours. At altitudes below 15,000 feet they planned to breathe the natural atmosphere by opening small doors in the gondola. However, the gas release mechanism failed to function properly and they were forced to remain aloft longer than was originally planned.

The flight was made for the purpose of studying conditions in the stratosphere, especially to obtain data on cosmic rays. The instruments with which they made observations were intact upon landing and the balloon was in good condition.

Dr. Piccard stated after the flight that the stratosphere was the only practical element in which to accomplish regular long-distance flying. He predicted that in the near future all air traffic would be moved to the stratosphere and that this can be accomplished when air-tight cabins for heavier-than-air craft are developed. One of the purposes of his flight, Professor Piccard stated, was to prove that man could live in such high altitudes.

The former world's altitude record of 43,161 feet was established by Lieut. Apollo Soucek, USN.

#### German Airplane Exports

GERMAN aircraft manufacturers exported 148 airplanes during 1930 with a total value of 5,910,000 marks (\$1,400,000). Of this number, thirty-one were Junkers machines valued at 3,185,000 marks (\$756,000). These figures, however, do not represent the total value of aeronautical products exported, airplane parts and engines and engine parts not being included.

THE first of several trimotor Junkers, ordered by a Grecian Airways Company, has been delivered.

#### German Pilots Visit England

HERR DOMINICUS, former Prussian Minister and president of the German Aviation Union, returning recently from a visit to England with a squadron of six German sport planes belonging to the union, commented on the splendid reception of the German filers in Great Britain. The German visitors to England were greatly impressed with the development of private fly-

ing in that country, which is extensively supported by the British government. In Germany, despite the great enthusiasm and optimism of the members of the aviation union, progress is naturally slower because the union is on its own and must purchase every plane with the supscriptions of its members.

#### Italy Orders a Do.X Flying Boat

THE Dornier works announce the completion of a second Do.X flying boat, built to the order of an Italian concern. The ship is equipped with twelve Fiat Type A 22 engines of 600 horsepower output each and is now undergoing test flights. The Italians have given orders for additional Do.X ships. The number ordered has not been announced.

#### ENGLAND

#### New Catapult Launches Nine-Ton Bomber in Test

A BOMBING plane weighing approximately nine tons was catapulted into the air within a space of a few yards during an experiment recently conducted at the Farnborough air field. The new catapult was designed by the Royal Air Force development branch to enable long-distance planes, heavily loaded with bombs, to take off from small fields or from the decks of aircraft carriers.

The bombing plane used in the test of the new catapult is powered with twin engines developing a total of more than 1,000 horse-power. In launching, the plane is mounted on a wheeled cradle to which is attached a wire rope. This rope passes forward to a pulley anchored in the ground, approximately 100 yards ahead of the plane, then back to the catapult.

The catapult consists of a portable winch

with a winding drum driven by two compressed air motors developing a total of 4,000 horsepower. Within three seconds, without initial shock, this apparatus hauls in cable at the rate of sixty miles per hour, pulling the bomber in its cradle at that rate.

During the first test of the new catapult, it required three seconds after the cable became taut for the bomber, with its own engines running at full speed, to leave the cradle and start climbing.

#### Scott Sets Australia-England Record

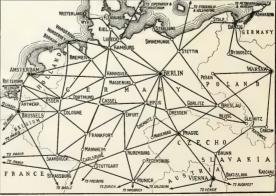
CHARLES W. A. SCOTT recently completed a flight from England to Australia and return, establishing new records for both the outward and homeward journeys. He landed at Lympne on June 5, having flown from Wyndham, Australia, in eleven days, exceeding the former record of thirteen days held by Wing Commander Charles Kingsford-Smith. The flight was made under difficult weather conditions. On the last two days Scott flew the distance of 2,500 miles from Aleppo, Syria, against strong headwinds.

On the flight to Australia, Scott made a new record of nine days, three hours and twenty minutes.

#### FRANCE

#### Establish World's Seaplane Records

LIEUTENANTS Paris and Gonord, French pilots, established on June 5 new world's seaplane records for distance and duration. Taking off from Arcachon on June 4, they covered a distance of 3,230 miles in thirty-six hours, forty-eight minutes and forty-four seconds, and landed the following day at Arcachon basin. The pilots flew over a circuit of 115 miles.



Map showing the principal airlines of central Europe

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THE Solofly System of Flying Instruction, although new in its adaptation, is a successfully tested method of flight training developed by Lieutenant George Rockwell from the system which he used as flight instructor in charge of Field 2 at Issoudum during the World War. It has been his experience that students taught the feel of the controls and automatic coordination before going into the air become far better pilots than those forced to assimilate the instruction while flying in a dual-controlled plane.



Low cost and safety are the two most outstanding features of the Solofly System which every prospective student should investigate in his own interests.

First, the average cost of a Private Pilot's course is from \$300 to \$400. This course, by the Solofly method, costs only \$215. Preliminary training costs only \$65. In addition to this remarkably low price, we offer the student a deferred payment plan on easy terms.

Second, the Solofly System teaches the art of flying in quick but easy stages, eliminating the hazards that accompany early training in high-powered planes. The first stage is the feel and coordinates that the stage is the stage in the stage is the stage of the stage is taking and take-off practice in the Taxiplane. The Taxiplane is an airplane whose wing area is

insufficient to permit its leaving the ground. The third stage is the handling of the controls in the air, during the take-off and when landing-in a glider. This stage is a part of the Solofly method because it trains the student to become a natural pilot rather than a mechanical one. The fourth stage is actual flight in the Soloplane, a low-powered, light airplane. An instructor accompanies the student on his first flights to check his ability and impart final instructions. From this point on the student is permitted to solo in preparation for his Private Pilot's examination by the Department of Commerce inspector.

See the Solo System units in operation at Glenn Curtiss Airport, North Beach, L. I.

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Set Closed Circuit Record

FRENCH pilots Joseph Lebrix and Marcel Doret landed at Marignane, France, on June 10, after a continuous flight of seventy hours and ten minutes over a distance of more than 6,500 miles, a new world's closed circuit distance record. The former record of 5,5641 miles was established by the French pilots Anthoine Paillard and Jean Mermoz.

# CANADA New Altitude Record

CAPTAIN John Parkinson established a new Canadian altitude record of 22,000 feet May 26 in a light Curtiss-Reid biplane on a flight at Montreal. He exceeded by more than 2,000 feet the former Canadian record which he established two years ago. Captain Parkinson completed the ascent in fifty-three minutes. His barograph went out of commission at 20,000 feet.

#### Canada to Cancel Air Mail

AIR MAIL service in Canada will be canceled at an early date, according to the decision of Prime Minister Richard R. Bennett, which was announced May 31 at Ottawa. Deficit in postal operations was reported to be the reason for canceling the service, the post office department facing a deficit for the last fiscal year of approximately \$6,000,000 and air mail flights being the least remunerative of the postal service.

Air mail lines in Canada extend from the Maritime Provinces as far west as Edmonton. It is reported that the transcontinental flights will be eliminated within two mouths. However, it was reported, there is a possibility that the Rimouski-Montreal line, which carries mail to transatlantic steamers, and the international line from Montreal to Albany, N. Y., may be retained if the companies consent to a revision of present contracts. The contracts would be canceled under a clause which provides that the government may set them aside if it appears to be in the public interest.

#### Saint John Flying Club

AT a recent general meeting of the Saint John Flying Club, the following officers were elected for the new season; president, F. A. Nicholson; vice president, H. E. Williams; treasurer, Jack English; secretary, Miss Daphne Paterson.

Operations will commence immediately with a new instructor, C. S. Kent, appointed by Squadron Leader A. T. Cowley of Ottawa. The flying committee is incharge of W. W. Rogers; finance, H. F. Rankine; publicity, F. A. Nicholson; membership, H. W. Hayter; and education, W. K. Goldine.

#### Toronto Flying Club

THE Toronto Flying Club has moved to its new airport on North Dufferin street, Toronto. The field is to be opened officially June 27. A new hangar has been constructed and an old farm house on the field has been converted into a club house by members. There are prepared and marked runways in three directions.

More than forty hours of flying were

completed by members on May 31 in the five planes which the club owns. J. A. Yonge is the club instructor and Arthur Flack, operations manager.

DEDICATORY exercises of Barker Field, Toronto, were held June 6. The program of events included formation flying by the R.C.A.F., demonstrations of the Detroit News autogine and acrobatics by commercial pilots flying Buhl Pup and Fleet aircraft.

AT a recent meeting of the Saint John Glider Club, Mr. Flood was elected president. Members are looking forward to an active summer. The site of the club is easily reached by street car and is one of the best in Canada. The shock cord method of launching is used.

INSPECTOR G. G. Wakeman of the civil aviation department, Ottawa, has selected a site for a municipal airport at Charlottetown, P. E. I., and work has been started. In view of the possibilities there a company will be formed by local men to start operating this summer.

#### **MEXICO**

[M. Hurst]

#### To Expand Mexican Air Force

THE war department has under study a plan to increase and organize on a larger scale the army air forces of Mexico, taking into consideration that there are now plenty of capable Mexican pilots. Ten corps of five bombing planes will be formed and an order has been sent to an American factory to construct these machines. During this year many new military pilots will be graduated, canable of handling the bombing planes.

IT has been reported that the aviation bureau of the department of communications will rigidly enforce the rule that airplane companies use only Mexican pilots and mechanics as stipulated in the concessions granted them by the Mexican government. Some of the airplane companies have not complied with this regulation on the grounds that there is not yet a sufficient number of expert Mexican pilots and mechanics.

#### COLOMBIA

A Spanish flying instructor was recently engaged by the Flying Club Santa Fe at Bogota. It is reported that the organization will begin the instruction of members and will acquire American-made flying equipment.

#### BRAZIL

THE German flying boat Do.X landed at Natal June 5 on a 125-mile flight from Fernando Noronha Island, completing a one-stop journey across the South Atlantic from the Cape Verde Islands. The ship flew the distance of 1,685 miles from Porto Praia to Fernando Noronha in thirteen hours and eighteen minutes at an average speed of approximately 125 miles per hour. The landing on the island was successfully made at

midnight without unusual incident.

The weather encountered on the crossing was excellent and the plane reached the island ahead of schedule. Communication by radio with Brazilian officials was maintained practically throughout the flight and regular reports of progress were made. The Do.X was inspected before taking off from the island for the mainland.

The itinerary of the plane in Brazilian waters includes the stop at Natal to reinstall furniture and equipment which had been removed at Boloma, Portuguese West Africa, to lighten the plane for the transatlantic flight. After overhauling the engines, the Do.X was scheduled to leave Natal for Rio de Janeiro for a stop of at least two weeks.

The arrival of the Do.X at Natal completed a journey which started from Altenrhein, Switzerland, November 5, 1930. Accidents and bad weather caused several delays. It is planned to fly the plane to New York.

The Do.X is powered with twelve Curtiss-Wright Conqueror engines. Fuel and oil consumption on the flight was reported to be satisfactory. The plane landed at Natal with fuel sufficient for two hours more of flying.

PASSENGER and mail air transport service between Porto Alegre, Brazil, to Santa Maria and Santa Cruz in the interior has been inaugurated by the Empreza de Viacao Rio Grandense, Brazilian air transport company. The service will be operated twice a week.

#### PERU

#### Shippe-Johnson Aerial Expedition Discovers Great Wall of Peru

DISCOVERY of Inca or pre-Inca fortification more than thirty miles in length and resembling the Great Wall of China was reported recently by members of the Shippe-Johnson aerial photographic expedition to Peru. The ruins were located from the air in the vicinity of Huancayo at an altitude of 1,000 feet, due east of Lima. Two previous attempts to reach this area were unsuccessful because of the difficulties encountered in making the flight over the mountains. Mining and archeological authorities have declared the photographs of utmost value to the geographical knowledge of the Andes and historical knowledge of the Incas.

THE government has issued a decree declaring that all air mail between Talara and Tacna will be carried exclusively by government planes. The decree states that existing contracts with the Faucett Aviation Company, Pan American Grace Airways and Compagnie Generale Aeropostale contain no clauses to prevent the government's military air force from exclusive monopoly of air mail service along the Peruvian coast as well as in the interior of the country.

PLANES of three operating companies in Peru during January of this year carried 549 passengers and flew 52,470 miles on 104 flights, according to information recently made available.



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#### WINGS OF THE ARMY

(Continued from page 35)

our recent discussions of war debts and disarmaments. When we suggest the muzzling of the dogs of war, it is not because we can't afford to keep a dog. The flight of those 700 planes was watched a long way and very likely somebody saw the point.

But this, I think, was only an incidental purpose of the big parade. Nor was it supposed to arouse our pugnacious instincts, though the pacifists think and say so. The fleet went forth for a little wholesome exercise in its proper element, and that's about all. The public was invited and the radio reporters went a little haywire. The Army officials and observers took notes and went away somewhere to digest them inwardly. The pilots took the ships home and went back to their poker game.

As a military exhibition it turned out to be a swell job of formation flying and a public testimonial to the reliability of modern motors. It seems no time at all since an airplane engine did well to hang together for a hundred miles or so. There were nearly a thousand motors at once in the skies above our cities, and if any of them conked they kept it to themselves. They came through bad weather and over tough country, and they totaled a mileage which makes a trans-Atlantic trip seem rather silly, if not actually superfluous

The most tragic incident of this ambitious affair was also, in some respects, the funniest. As the fleet on wings soared and circled over Dayton, Boston, New York, Philadelphia and Washington, brave little battalions of determined pacifists did what they could to stage counter demonstrations in the streets below. They also wrote letters to the Commander in Chief and to the local newspapers. Some of them stood up in pulpits and advocated the excommunication of the Army Air Corps and all its works.

Unfortunately for their argument, the public was too busy at the moment to give it much attention. In good Biblical phraseology, we showed ourselves a stiff-necked people, for which there was a perfectly good reason at the time. But when the parade was past and the regular order of business was resumed, there was time and patience available for a little consideration of the pacifist argument.

Probably the commanding officer of the maneuvers was as successful as anybody in disposing of the pulpit pacifists. He pointed out, gently but firmly, that without the protection of arms and armaments preaching might easily become a rather precarious business. He might have gone further and suggested the fact that freedom, whether religious or secular, was never won except by a fight and has always needed the protection of able-bodied citizens who are not too proud to fight for their rights. And if he had cared to be real mean about it, he might have recalled the fact that during the last war the most bitter, bloodthirsty and belligerent of the four-minute orators and public propagandists were not the Army and Navy men but the clergymen. That's a matter of record, whether you like it or not.

But it is kindlier to dispose of the pacifist demonstrations by admitting that they were only a part of the general misunderstanding as to the purposes of the big parade. I doubt very earnestly whether these same friends of peace would make public objection to the fact that the State Police indulge occasionally in pistol practice, presumably in order that gangsters and gunmen shall not get away too easily with their nefarious intentions. I don't insist that it does much good, for those who are experienced

(Continued on following page)

JULY, 1931



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(Continued from preceding page)

with firearms know that nobody ever hits anything with a revolver except himself or his best friend. But the theory and practice of preparedness is not considered disreputable or unnecessary in local affairs and is equally logical among nations.

The pacifists, moreover, probably indulge in life insurance, put fences around their properties and lock their doors at night. Some of them take setting up exercises in the mornings to keep fit for trouble; some of them wear both belt and suspenders to be on the safe side. And all of them would howl at once for an army, a nary, an air corps and a gas-proof cyclone cellar if they woke up one morning to find an enemy within striking distance of our shores.

The only assumption that excuses their pitiful protest against preparedness is the delusion that there are to be no more wars. I remember rather painfully the summer of seventeen years ago, when a number of good people were enjoying the same comfortable delusion. I went peacefully to Europe in late June, secure in my rights and privileges and the general impression that the brotherhood of man was in good working order. Before I could get back again the nations of half of Europe were at each other's throats and submarines were prowling the Atlantic. I was in London's Hippodrome on the night of August 4, 1914, when some cheerful idiot came out on the stage and announced that England was at war with Germany. Most of those present, having forgotten everything that their fathers and grandmothers had learned about war, stood up and cheered like lunatics. I think I stood up, but I like to remember for the sake of my own self respect that I didn't cheer. I couldn't see anything cheerful to cheer about. And I doubt that much cheering was done in the council chambers at Downing Street, or in the offices where soldiers and sailors worked desperately to patch the holes in England's defenses against a distant but determined enemy.

It may be argued with some certainty that an over-armed nation or group of nations started the weary war, brought on the painful peace, and ultimately caused this delightful depression. But this does not say that there is any security whatever in weakness. Excessive armament is undoubtedly dangerous, but the cure for it is common sense and not pacifist unpreparedness. And those who think that a fleet of 700 planes is anything more than a minimum of aerial defense for a nation of 120,000,000 people, three and a half billion square miles of territory, and nearly ten thousand miles of seacoast should go back to school and study elementary arithmetic. Which is about the most painful punishment I can suggest for them at the moment.

What we all seem to lack as we watch our aerial maneuvers is a sufficient effort and exercise of the imagination. Most of the spectators at this year's show could imagine nothing much but bombs. They told each other comfortably that so many airplanes could drop so many tons of bombs down the city chimneys, and wouldn't that be terrible? But on the other hand, the massed squadrons of defense would scare the bombers away, and wouldn't that be nice? And so they went back to work and play, put another nickel in the savings bank, and complained about the taxes.

They failed altogether to see the pattern of real war behind the neat and genteel formations of the flying fleet. They did not hear the crackle of anti-aircraft guns nor the echoes of dog-fights too high in the sky to be seen. They thought nothing of the fact that raiding fleets must

(Continued on following page)

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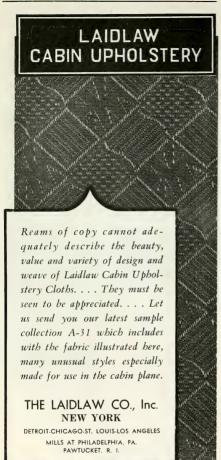


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(Continued from preceding page)

be met and fought far away from their objectives, and that the best of defenses may let a load of destruction slip through. They did not choose to contemplate the fact that an air fight does not confine its casualties to the enemy fleet. They could not imagine what might lie behind a raiding air force—the submarines harrying our shipping, the gray transports seeking a landing, the airships scouting the seas and watching for a weakness in our defenses.

Nor did they worry much about the greed and envy, the fears and jealousies, the madness and the miseries of which wars are made, though these are still rife and dangerous in a world which will not learn to remember. They did not admit in their hearts that we can no longer keep clear of the troubles of others nor sit in smug safety behind a tariff wall and the open sea.

The signs of the times were in the sky as the big fleet went by. Most of us missed them. We admired the show and wondered what it cost. We invented ingenious descriptions for a flock of airplanes flying in formation, and enjoyed the thunder of machinery which filled the vaulted sky. We babbled cheerfully about war, without remembering the dread and danger of war.

We failed in one other respect to match our imaginations to this extraordinary opportunity. We thought too much of the planes and too little of the men flying them. And yet every aircraft in the great parade was only a weapon and instrument in the hands of a man, obeying his skill and multiplying his strength by the magic of machinery.

The fleet itself moved and maneuvered under command badly or well, according to the brains that directed it. The last lesson, indeed, of the air show is that the strength of America is still more a matter of men than of machinery. And in answer to all well-meaning but misguided pacifists we may ask whom they would choose to trust in time of emergency. Would they prefer the street-corner orators, the pulpit panhandlers, the pink-tea journalists who seek peace and pursue it with a fountain pen or typewriter? Or would they entrust their lives, their fortunes and their sacred honor to those who build the defenses of America and keep them fit and ready for use?

The flight has passed by and the birds have gone back to roost. Baseball is at mid-season, and we are still looking for a heavy-weight champion. The depression continues, though we gradually grow used to it. Hot weather sends us to the mountains and seashore if we can afford it, and to the icebox and soda fountain if we can't. There is much on our minds, indeed, and most of it of no importance.

But we should all sleep sounder at night because of the big parade. It was not war, nor did it prophecy war. But it proved that if war should come the Army of the United States will not be altogether lacking in the wings of war nor the ability to use them.

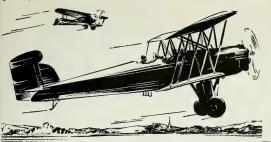
#### CAMPAIGNERS ALOFT

(Continued from page 46)

the insects and a couple of speakeasies—we'll have these until the end.

However, waging war on war by destroying our own defenses while other nations develop armament, merely means that we'll be rubbed out before our time. If go we must, let us defer our departure as long as possible. And the way to defer it is not to render ourselves helpless against aggression. The fact that the rabbit is a natural born pacifist who refuses to fight with the fox fails to inspire the fox with any feeling of magnanimity. All that

(Continued on following page)



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(Continued from preceding page)

pacifism gets the rabbit is a reserved seat inside the fox. The thing that keeps the rabbit with us is not his pacifism but the fact that he doesn't believe in birth control. If Margaret Sanger ever educates him, he's a goner.

However, humanity, mean and ornery as it may be, has a habit of solving problems and surmounting difficulties. For instance, we're flying now over the hills of Pennsylvania. Only a few years ago it was a physical impossibility to go above them. We walked or drove over or around them, or tunnelled under them. They were a real difficulty to our transportation. Even today we have no automobile road or railroad running in a direct line between Columbus, Ohio, and New York City. We'll never have one. Yet we have a path in the air that is level and straight, and the hills that we used to consider such a barrier are not even an air bump under our wings.

Well, well-enough of this moralizing. The pacifist propaganda had a certain effect upon the maneuvers. So many timid souls wrote in begging that no airplanes should be dropped on them that G.H.O. decided that at Chicago the planes should fly rather far out over the lake so as not to wake up some of the old ladies with the roar of the motors. The review went past about two miles away. This led to several faulty assumptions on the part of the populace. For instance, it was rumored that the Army didn't want to give any bombing information to Al Capone -he has enough now. Then another rumor spread that the Army's maneuvers were actually controlled by an old admiral sitting in a wheel chair on a battleship miles out in Lake Michigan. I asked General Fechet if there was any truth in that one, but he said no. I don't believe it possible an Admiral would ever get that far away from Washington, anyhow.

I'm having a hard time writing this contribution to the higher criticism, because every now and then one of these newshounds takes the paper out of the machine and reads it, hunting for ideas, I suppose. But I've fooled them—I'm not putting any ideas in. And it's hard to write with the wonderful scenery of Pennsylvania sliding back under our wings. We have a sunny, hazy day: soft, mellow sunlight laid over the brown and green fields, a restful, dreamy, languid glow of light, spread like a kindly benediction on the warm earth. Sort of day you're really thankful to be alive. You know, I don't even resent a Republican today. Speaking of them, I've just glanced at our two Congressmen. They're snoozing away as comfortably as they ever do in Washington. Like Simmons beds, they're built for sleep.

I wish you six faithful readers were here. There's lots of room on this great airliner, for we have only nine-teen aboard. Room for you valued six, and seven more. And when I first started flying the greatest number that any airplane had carried was, I believe, three! We had 700 gallons of gasoline aboard when we started from Columbus. Over two tons of gasoline alone, not counting Sherman Altick and the rest of us! As we rumble along over this good old world we have relieved the surface of the earth of some 12½ tons, including Mr. Altick. There's progress for you.

Well, I've done enough for you six lads for one day. All the other producers of doubtful literature have stopped work and are examining Pennsylvania, so I shall examine it too. We are flying over the upper reaches of the Potomac River. Poor thing, if it only realized what it had to pass in Washington it would turn around and run

(Continued on following page)

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back up hill. But there it is, winding off into the distance. It's a very devious river—just the sort of river you'd expect to run past Washington. Ahead is Philadelphia—another mystery like the pyramids. Millions have looked at the pyramids and Philadelphia and wondered how they came into being.

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Here I am, a week later, amid the peaceful seclusion of Fallen Arches. The roar of the First Provisional Air Division has died away in the distance, and all I hear now is the dull monotone of surf breaking on the beach, and the strident tones of the lady over the way berating her progeny. The old campaigner is back from the wars.

As a war correspondent I enjoyed the privilege of flying with the 11th Bombardment Squadron which hails from Rockwell Field, California, under the command of Lieutenant C. H. Howard. I was with them, in a wing nacelle of a Curtiss Condor, as they "bombarded" Boston and Atlantic City. I was still with them when the 95th Squadron of Boeing Pursuits dived on them in flights of six—a remarkable demonstration of pursuit attack on bombers. Diving at over 200 miles an hour, those venomous little ships came straight at us, and when they pulled out of their dive on one occasion I'll swear they weren't 25 feet above the last ship in our squadron. I'm rather glad I'll be too old to do any bombing in the next war. I realize now that we ancient bombers of 1917-18 had an easy time of it.

Below us were the attack ships, Curtiss Falcons, suppositionally armed with six machine guns, four firing ahead, and two handled by the gunner in the rear cockpit. What a sight it was to sit in the bombers and watch the pursuits drop from the sky and dive on that squadron of attack ships, flying so closely that at times the wing-tip of one Falcon was nestled in between the wing and tail of the next ship. If an attack pilot gets an itch in the back of his neck, he signals the nearest ship which slides in and scratches his neck with a wing-tip. I saw that done several times.

The precision flying of all the squadrons was remarkable, but what impressed me most was the way the pilots handled those great bombers. Size considered, they flew as closely as did the pursuit ships. A favorite stunt was to rest the tail wheel of the bomber ahead in the front cockpit of the bomber behind—or nearly so. I looked behind me on one occasion and felt a distinct chill pass over me as I saw the propellers of the Conquerors sawing away scarcely a dozen feet from our tail! But I soon got used to these tactics and had such confidence in the skill of the pilots that I forgot to get nervous when a wing tip slid near us.

The maneuvers were held to supply answers to various problems that would present themselves in a war, and the answers were supplied. Now the staff knows precisely what it can do and cannot do with an air division. It can do, it appears, considerably more than the most optimistic believed actually could be done. That 672 airplanes could be flown a total of over 3,000,000 miles with no major mishaps seemed too much to expect. But it was accomplished. That the involved maneuvers of such a vast number of planes could be carried out with every airplane accounted for and under control every minute seemed impossible. But that was done. By radio the general staff. on the ground or in the air, could direct the movements of every one of those 672 airplanes. They moved them about as they would move markers on a map. It was wonderful.

Too much credit cannot be given Brigadier General Benjamin D. Foulois and his capable staff for their planning and execution of those maneuvers. If anything had gone wrong, General Foulois would have been blamed. Everything went off triumphantly, and therefore the credit should go to him. He has demonstrated beyond a shadow of a doubt his fitness to succeed General Fechet when that great air commander retires. We are certainly fortunate

(Continued on following page)



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to have two such men directing the Army Air Corps. These maneuvers have taught us much. Not the least valuable demonstration was to how great an extent the military air forces of the country will be dependent in time of war upon the facilities developed by commercial aviation in time of peace. Without the airports made possible by commercial air needs, a war would find us utterly unable to concentrate a great military air force where it was needed. If you recall an article on aerial invasion that we published a few months ago, you will realize how necessary it is that we should have facilities for handling great numbers of war planes, concentrated in certain areas to repel invasion. The planes must be able to fly from airport to airport across the country, where they may be assured of adequate service. In all areas most vulnerable to attack there must be landing and servicing facilities capable of looking after one or even more air divisions. These can be supplied at a reasonable expenditure only by commercial aviation rendering a commercial service that

The residents of cities that witnessed this demonstration should now have some idea of what must happen to them if an air division flying over them in time of war is the enemies', and not their own. Yet I doubt if they understand. Airplanes do not look as deadly as they are. The citizen does not seem able to realize that an enemy air division the size of this one could deluge New York City with 100,000 pounds of bombs in one flight and could fire 2,000,000 shots per minute with machine guns. If such an invasion occurred, what hope would there be for the millions in New York? As the survivors of the first raid started to clear out, they would make the exodus of the Children of Israel from Egypt look like an Elks' picnic from Sauk Center.

the public is paying for. Failing that, the government

must supply adequate landing facilities at strategic points.

#### MORE ALTITUDE FLIGHTS

(Continued from page 37)

professional parachute jumper, who took off with pilot O. M. Mosier in a Lockheed Vega cabin monoplane which was powered with a Pratt and Whitney "Wasp" motor of 425 H.P. After a long climb, during which most of the oxygen supply was consumed, a parachute jump was made with the sealed barograph strapped securely to the body of the jumper. Soon after jumping Donohue was reported to have lapsed into unconsciousness, due to lack of oxygen, and the latter part of the descent was made in a semi-conscious condition. A landing was made 3 miles east of the Municipal Airport, where the jumper was picked up by some passing motorists, hardly conscious and bleeding at the nose. Tests on the barograph showed a minimum pressure of 326 millimeters of mercury, which is equivalent to 6,453 meters, or to 21,171 feet. This proved to be the loftiest parachute jump made during the year.

On September 13th, Mrs. Signe Smith, with E. Stewart as the pilot, took off from Rosecrans Field, St. Joseph, Missouri, in a Bird landplane which was powered with a Wright Whirlwind motor of 165 H.P., for a parachute jump from maximum altitude. The jump was made after a climb of approximately 2 hours. Some time later Mrs. Smith made a safe landing in the bottom lands of the 102 river, northeast of St. Joseph. The barograph, when officially tested, showed a minimum pressure of 379 millimeters of mercury, which is equivalent to 5,381 meters. or to 17,654 feet. This was an altitude record for a

women's parachute jump.

During the period September 21 to October 5, the first National Soaring Contest was held at Elmira, New York. Here, above an amphitheater of hills rising from 600 to 800 feet in height, some surprising altitude marks were established. The greatest elevation was attained by Wolf Hirth on October 4 in his German Kegel sailplane. The barograph carried in his ship, when tested, showed that a pressure change from 728 to 650 millimeters of mercury had taken place, corresponding to take-off and maximum altitude respectively. This change was equivalent to an altitude above the starting point of 909 meters or 2,982 feet. The performance is eligible for recognition only as a record credited to Germany.

Warren Eaton, piloting a Baker-McMillen Cadet II, a utility glider of thirty-four-foot span, achieved the next greatest altitude, establishing an American record. Tests on the recording instrument showed a maximum altitude above the starting point of 730 meters, which is equivalent

to 2,409 feet.

Jack O'Meara, flying a similar ship, was not far behind with an altitude of 621 meters above the starting point,

which is equivalent to 2,037 feet.

Wallace Bachus, flying a Franklin utility glider of thirtysix-foot span, was reported to have attained an altitude comparable to that made by Eaton and O'Meara, but unfortunately a poor barograph trace and lack of its identification prevented official recognition.

On October 20, Mrs. Marion E. Conrad made a flight from Port Washington, Long Island, New York, in a Savoia-Marchetti seaplane powered with a Kinner engine of 125 horsepower. At the maximum altitude attained the temperature recorded in the barograph by means of a bimetal coil was —7°C (+19°F). The instrument, when tested at this temperature, showed a minimum pressure of 451 millimeters of mercury, which is equivalent to 4,103 meters, or to 13,461 feet. This performance established a women's record for altitude in a seaplane.

On the afternoon of October 26, Paul Clough, a school boy of Mineola, N. Y., took off from Roosevelt Field, Long Island, in an Aeronca light landplane, a ship of the fourth category. The monoplane was powered with a two-cylinder Aeronca motor of thirty horsepower. After a steady climb for nearly two hours, the maximum altitude was reached with the ship's altimeter indicating 11,800 feet. The temperature of the air then observed by the pilot was +9°F. The return was made in about a half-hour, with a perfect landing at the home airport. The barograph, when officially tested, showed that a minimum pressure of 507.5 millimeters of mercury had been reached, which is equivalent to 3,208 meters, or to 10,525 feet. This was a recognized American record.

On November 17, M. S. Smith took off from Union Airport, Lincoln, Nebraska, in a Lincoln cabin monoplane powered with a Kinner engine of 125 horsepower. A steady climb was made to maximum altitude. Official tests on the barograph showed that a minimum pressure of 342.5 millimeters of mercury had been reached, which is equivalent to 6,005 meters, or to 19,701 feet.

On December 28, Miss Juanita Burns took off from the municipal airport at Los Angeles, California, in an Aircub landplane, powered with a Lambert motor of ninety horsepower. After climbing for about two hours, the maximum altitude of the ship was attained. An excellent trace was made on the barograph chart, which after tests showed a minimum pressure of 356.5 millimeters of mercury, which is equivalent to 5,821 meters, or to 19,098 feet.

(Continued on following page)



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Lindbergh Field, San Diego, California

(Continued from preceding page)

On January 4, 1931, Kenneth W. Scholter made a flight from Issoudun Airport, Hudson, Ohio, in an Aeronca land-plane equipped with an Aeronca notor of thirty-five horse-power. Tests on the barograph showed a minimum pressure of 369.5 millimeters of mercury, which is equivalent to 5,564 meters, or to 18,254 feet. This altitude would have been officially recognized as a record in the light land-plane class if a smoked chart had been used on the barograph drum as required by F. A. I. regulations instead of ink on a paper chart.

On March 6, Miss Ruth Nichols took off from the Jersey City Airport, New Jersey, in a Lockheed Vega land-plane powered with a Pratt and Whitney supercharged Wasp of 450 horsepower. A steady climb was made to maximum altitude which was attained in approximately one hour. The barograph, when tested, showed a minimum pressure of 232.5 millimeters of mercury, which is equivalent to 8,761 meters or to 28,743 feet. This flight was successful in establishing a new world altitude record for women.

On March 13, Miss F. G. Renner made a flight from Robbins Field, Stow, Ohio, in a Waco landplane equipped with a Wright J-6 engine of 240 horsepower. At the maximum altitude attained, a record strut thermometer indicated a free-air temperature of —42°C (—43.5°F). The barograph when tested showed a minimum pressure of 275.5 millimeters of mercury, which is equivalent to 7,617 meters, or to 24,990 feet.

On April 8, Miss Amelia Earhart took off from Pitcairn Field, Willow Grove, Pennsylvania in a Pitcairn PCA-2 Autogiro, equipped with a Wright J-6 engine of 300 horsepower. Two flights were made on the same day. The barograph when tested for maximum altitude showed a minimum pressure of 367 millimeters of mercury, which is equivalent to 5,613 meters, or to 18,415 feet.

On April 9, Miss Elinor Smith took off from Roosevelt Field, Long Island, in a Bellanca monoplane equipped with a Pratt & Whitney supercharged Wasp of 450 horsepower. The barograph, when tested, showed a minimum pressure of 276 millimeters of mercury, which is equivalent to 7,605 meters, or to 24,951 feet.

On April 12, Kenneth W. Scholter repeated his altitude attempt of January 4 at Detroit, Michigan, in an Aeronca landplane powered with an Aeronca motor. On this occasion a barograph with a smoked chart was carried but, unfortunately, 887 feet less altitude was attained, resulting in failure to establish a new record. The barograph, when tested, showed a minimum pressure of 382 millimeters of mercury, which is equivalent to 5,324 meters, or to 17,467 feet

(Editor's Note: Since the above flights, a world's altitude record of 52,480 feet was established in a hydrogen balloon. See page 114. An altitude record of 15,000 feet for light planes weighing 500 pounds or less and carrying two passengers was set. See page 106.)

#### AIR-HOT AND OTHERWISE

(Continued from page 38)

ing in handling swift military aircraft and a high standard of excellence of that equipment which our manufacturers produce. According to the law of averages, The New York Times declared, sixteen accidents and five fatalities were expected. Therefore our fliers deliver more of good and less of evil than we reasonbly might expect of them, thanks

to Generals Fechet and Foulois.

Now let's think about Air Mail for, say, five minutesa period of time during which it carries more letters more miles than any agency has ever done before in the world's history. The cost of Air Mail rose from \$765,549 in 1926 to \$20,015,969 in the year of latest record (1930) and its service increased much more rapidly, which makes it the best of business ventures. And income. Besides the \$17,-042,521 paid for carrying air mail in 1929 a growing additional income from passenger and express carriage had risen to \$5,761,151.

A survey prepared by a financial organization, which seeks to find which business or businesses will lead the United States out of its present depression finds evidence, brethren, that it's going to be ours! How about it?

This survey notes 12.7 per cent hard times increase of Air Mail poundage over 1929 and the first guarter of 1931, showing a further increase of 20.7 per cent over the similar period of 1930. Poundage carried in the first quarter of this year exceeded 2,000,000. Increase of mail flown in 1930 was 28.2 per cent; with this year's first quarter levitating that by another 49.6 per cent. No; that's not a misprint. Forty-nine and six tenths per cent is right. Passenger miles flown were up 10 per cent for the first quarter of this year over the similar quarter of last year. Air express poundage, so far from being unfavorably affected by the business depression, wouldn't have it that way, but grew amazingly: 375 per cent growth in the first quarter of 1931 over the same months of 1930. The depression year could not even feaze non-schedule flying. In the second half of 1930 paid passengers increased to the creditable total of 1,-373,000. Airports seem to thrive in times which wither other enterprises, for they increased 10 per cent in 1930. Licensed flyers became 19 per cent more numerous, totaling 15,550, with student permits doubling.

So what's the industry's complaint? Listen, me lads: the first quarter's actual deliveries of engines increased 10 per cent over the previous year's record. The dollar decrease, compelled by general price reduction, was only 91/2 per cent, but don't take that to heart, for the dollar value of airplanes of all types delivered increased more than 9 per cent, though the number almost invisibly decreased. The survey shows that the air industry stands almost alone in its manifestation of vitality during troublous moments due to this and that for which it is not wholly responsible.

So what's the matter with you fellows? Stand up and grin, you lucky devils! Be sorry for the other fellow who's not lucky enough to be up in the air and then get down upon your marrowbones and thank the Lord that you're in aviation. There's no denying it: we're just plain lucky.

Brother Whozis will now lead in a song of thanksgiving, drowning out the groans of all the grousers. Let us sing!

#### THE ASPECT RATIO

(Continued from page 49)

aspect is sound in general, but not when it comes to small variations of the design. Its thoughtless and unconditional recommendation is objectionable. The existence of such a partially true rule in spite of the much better span square loading rule shows how little matured is the application of aerodynamic theory. The whole misunderstanding probably developed from confusing the force and its coefficient. The use of airforce coefficients is exceedingly useful, but the real forces must not be entirely forgotten.

For obtaining a good aerodynamic efficiency we prefer.

(Continued on following page)

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accordingly, to recommend the reduction of the span square loading, which in each individual case may or may not mean a larger aspect ratio. This rule avoids also any misunderstanding about the induced drag of biplanes. The induced drag of a biplane is hardly smaller than the induced drag of a monoplane of equal area and span and not because the aspect ratio of the individual wings of the biplane is larger. It is somewhat smaller because the biplane extends farther up and down than the monoplane, and accordingly its effective span is about 10% larger than its actual span. The aspect ratio of the biplane is computed by dividing its span square by the area of all wings, not by the area of any individual wing, and ordinarily is not particularly large.

The same arguments hold true for wings in tandem. Even when they are comparatively far behind each other, the aspect ratio for the computation of the coefficient of induced drag is computed from the entire wing area of all wings. Theory shows that tandem arrangement and stagger have an appreciable effect on the resultant induced drag. However, they have an effect on the distribution of the induced drag between the two wings. The downwash is stronger in rear than in front. The front wing may actually have upwash, and no induced drag at all. Its angle of attack and its lift is then also increased, and that of the rear wing diminished. The wings work decidedly under different conditions, chiefly through the downwash flow, but the resultant downwash effects of the two tandem wings considered as a unit still are given by the universal formula.

Downwash effects take place also between wings flying side-by-side. Each of them is then in the upwash of the other and in consequence the lift is increased and the induced drag is diminished, with both. The effective or apparent aspect ratio of the two side-by-side wings, or else their effective span, is larger than the actual aspect ratio or span. This is entirely plausible. As the two wings approach each other gradually, the effective span must increase, for when at last the right hand wing tip of the left wing comes into touch with the left hand wing tip of the right wing, the two wings become one in aerodynamic respect, and their effective span becomes the sum of the individual spans.

It follows that airplanes flying side by side perform better than the two airplanes flying by themselves. The birds know that, or at least act as if they know. Many migratory birds, particularly the large and heavy ones, fly in characteristic formation. Their instinct urges them to pick upwards air current, and picking up the upward air current created by their companions leads them automatically into formation.

A large aspect ratio is also recommended for the stabilizing areas, not only because such aspect ratio reduces the induced drag but particularly because it increases the effectiveness of the horizontal tail surfaces and permits the use of smaller stabilizer area. The stabilizer counteracts the travel of the center of pressure by creating moments at certain changes of its angle of attack. As the aspect ratio of the stabilizer increases the slope of its lift curve becomes steeper, and for the same change of the angle of attack the change of the lift becomes larger. A stabilizer of larger aspect ratio is therefore more effective than one of smaller aspect ratio.

On the other hand, the steeper the lift curve of the stabilizer, the sooner does it reach its maximum lift coefficient, and become ineffective, for the maximum lift coefficient is not increased by a large aspect ratio. The

wing section of the conventional stabilizer is poor anyhow and does not encourage a particularly high lift coefficient. In spite of a smaller attack angle of the stabilizer, when having too large an aspect ratio, it may reach its maximum lift coefficient before the wings do. A dangerous tendency of the airplane to nose up and to stall is the consequence. The tendency to give the stabilizer a large aspect ratio should, therefore, not be followed to the extreme.

When the airplane (particularly a low wing airplane) is close to the ground while landing and taking off, the downwash flow is obstructed by the solid ground. The ground contributes in sustaining the lift production and helps to prevent the full development of the lateral flow, This is beneficial, as the induced drag is then also smaller than in free flight and the take-off is improved. These effects can be analytically computed and there exists some literature about this problem. The degree by which the downwash flow is obstructed by the ground is mathematically determined. The effect is the same as if the span was larger than it is actually. The same effect takes place in wind tunnels, in which the model is exposed to an air stream enclosed by solid walls. There again direct pressure effects occur between the wing and the walls. The air is less at liberty to move sideways around the wing than if the solid walls were absent. The effect again can be computed and the results can be corrected after the test. In wind tunnels with a free air jet, the effect is just the opposite; the wings show off less favorably than in an unlimited air flow, and a correction with the opposite sign has to be used.

The effect of the ground on the downwash flow must not be confused with the so-called "cushion effect" of the ground. Observation seems to indicate that the minimum supporting speed of an airplane near the ground is appreciably smaller than in the free atmosphere. Ten per cent improvement is often quoted as an estimate. This is equivalent to an increase of the maximum lift coefficient near the ground, and has therefore nothing to do with the downwash. The downwash effects can be studied in the windtunnel, but not the cushion effects without an elaborate arrangement, because in the flying field, on quiet days, there is no motion of the air relative to the ground, but such motion would ordinarily occur in the wind tunnel, between the moving air and the resting replica of the ground. That would change the friction effects.

The cushion effect must be such a friction effect. The mass forces of the pure potential flow are too small to have a noticeable effect. It is probably a change in the steady flow, caused by the friction of the ground, and its stabilizing effect on the potential flow of the wings. Very little definite information is known about these things, and right here is another problem for fruitful aerodynamic research. There probably exists also some kind of cushion effect or anti-cushion effect in wind tunnels, so look out and beware, for even a full scale wind tunnel is no assurance against errors from that source.

The span square loading of the wing is in close analogy to the disc loading of propellers, to which we shall come later. Only a few people use the aspect ratio for propellers, that is, the aspect ratio of the propeller blades. The greater soundness of referring to the propeller diameter directly is generally recognized in the propeller art, which is much older than aeronautics, and created by naval architects. The greater soundness of referring to the span rather than to the aspect ratio of the airplane wings will also be recognized eventually.

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H. 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Jordan80c                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | AIRCRAFT LAW-MADE PLAIN. George B. Logan, A. B. L. L. B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| INDIA BY AIR. Sir Samuel Hours \$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Maj. V. W. Page\$2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | AIR POWER AND WAR RIGHTS.  J. M. Spaight  AVIATION LAW. Hours G. Hatchbirg \$7.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| LITTLE AMERICA. Richard E. Byrd\$5.00 PILOTS' LUCK. Drawings by Clayton Knight Excepts from                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Orville Kneen\$3.50 GLIDERS AND GLIDING. Ralph Stanton Barnaby\$3.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | LAW OF AVIATION. Rowland W. Fixel. \$7.50<br>LAW OF THE AIR. Carl Zollmann\$5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Drawings by Clayton Knight, Excerpts from<br>stories by Elliott White Springs; Capt. A. Roy<br>Brown; Floyd Gibbons; Norman S. 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Fercival White                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | AIR FOWER AND WAR RIGHTS.  J. M. Speight  AVAITON LAW Henry G. Hotchkist.  AVAITON LAW Henry G. Hotchkist.  AVAITON LAW  THE LAW IN RELATION TO AIRCRAFT.  L. A. Winnfield, M.C. D.F.C., and R. B.  Spenkt, M.C. ON REPORTS.  \$10  AVAITON MEDICINE.  \$10  AVAITON MEDICINE.  \$10  LONIS H. 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Clevenger \$1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
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As related to                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | MODERN FLIGHT. Cloyd P. Clevenger\$1<br>PRACTICAL FLIGHT TRAINING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | MANUFACTURE AND USE OF PLYWOOD AND GLUE B. AD USE OF PLYWOOD AND GLUE B. AD USE OF PLYWOOD AND GLUE B. AD USE OF ADJUNINUM AND ALL MINUM ALLOYS, ROPE J. Anderson. \$10 ENGINEERING MATERIALS (VOL. 1) Non-Ferrous and Organic Materials. 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| THE FIRST WORLD FLIGHT. 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Barrett Studley, U. S. 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Robert J. Anderson\$10 ENGINEERING MATERIALS (VOL. I)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
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II) Non-Ferrous and Organic Materials.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| THE OLD FLYING DAYS.  #150 or Turner of GERMANY.  (The story of Beron Von Richthofen).  #150 GERMANY.  #150 GERMANY.  #150 A. GERMANY.  #1           | PRACTICAL FLIGHT TRAINING. Livil Barrel Studiey, U.S. N. 35 SIMPLIFIED AEROOV Byton G. Jones. 35 SIMPLIFIED AEROOV Byton G. Jones. 35 SKYCRAFT 4 Superise Foot 32,50 SKYCRAFT 4 Superise Foot 33,50 SKYCRAFT 4 Superise Foot 34,50 THE AEROFFANE Frederice Buddell 33 THE AERO OF ELYNG. Capt. Norman Macmillan, M.C. A.F.C. \$1,75 Capt. Norman Macmillan, M.C. A.F.C. \$1,75                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | A. W. Judge ST. SO ENGINEERING MATERIALS (VOL. III) Theory and Testing of Materials. A. W. Judge \$6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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H. Glaupt                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | MAN AND WEATHER, Alexander McAdie\$2 METEOROLOGY FOR AVIATOR AND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| NAVIGATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Dr. Mas M. Munk                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | AERONAUTICAL METEOROLOGY, (Revised chilon). 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(Continued from page 48)

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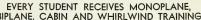
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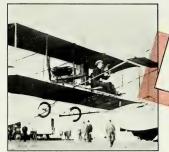
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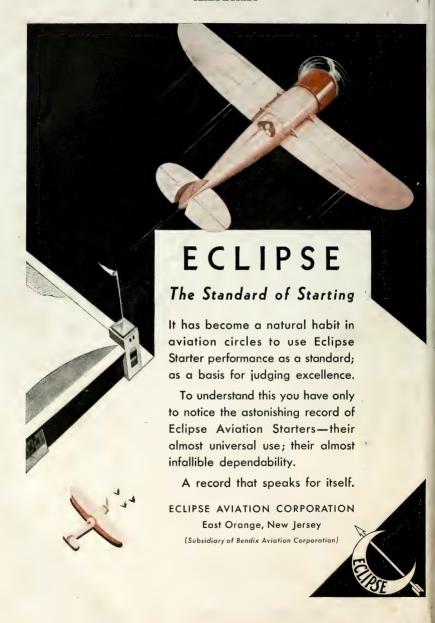
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Wiley Post and Harold Gatty with their record-smashing, Wasp-powered Lockheed. The map shows their route, which took them over two oceans, across seven countries and through temperatures varying from torrid to arctic. The total flying time for the distance of 15,474 miles was 4 days, 10 hours, 8 minutes.

To Wiley Post and Harold Gatty who flew their Lockheed plane around the world in 8 days, 15 hours and 50 minutes, the builders of their Wasp engine extend heartiest congratulations. The engine used was a standard supercharged Wasp, a year old, which had had approximately 300 hours of use in Mr. F. C. Hall's private Lockheed. This same engine, flown at full throttle for 9 hours, won the Los Angeles-Chicago non-stop derby of the 1930 National Air Races at an average speed of 192

m.p.h. Prior to the world flight the engine was overhauled by the Aero Corporation of California.

Checked after its grueling flight of 15,474 miles, the Wasp was pronounced by Post to be ready, without any replacement, for another trip around the world. Just one more demonstration of the kind of Pratt & Whitney stamina which accounts for the use of Wasp & Hornet engines by the Army, the Navy and on most of the important, regularly scheduled air transport lines of this country.

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# Neither Mysterious nor Miraculous



"For the Greatest Achievement in American Aviation"
(Extract from article in May, 1931, issue of The National Aeronautic Magazine)

"Aviation's dramatic march of progress from Orville Wright's first flight at Kitty Hawk to the commanding position it now holds in the affairs of the Nation was strikingly symbolized on April 22 when President Hoover in behalf of the National Aeronautic Association presented the Collier Trophy for 1930 to Harold F. Pitcairm and his associates, Geoffrey S. Childs, Edwin T. Asplundh, James G. Ray and Agnew E. Larsen.

"There was a note also of prophecy in the ceremony for the occasion included a flying demonstration that a few short years ago even the most fanciful would have held impossible.

"For the greatest achievement in aviation in America the value of which has been demonstrated by actual use during the previous year," reads the inscription on the famous trophy, the awarding of which has been for many years an annual function of the National Aeronautic Association. For 1930 the award was made for the development and demonstration of the autogiro, that remarkable new type aircraft considered by many the most revolutionary development in heavier-than-air craft since the first flight of the Wright brothers in 1903."

THE GROWING IMPORTANCE OF THE AUTOGIRO TO AVIATION, RESULTS FROM ITS PROVABLE CORRECTNESS

ANYONE with a sufficient knowledge of the theory of flight and a capacity for higher mathematics can understand and prove the correctness of the Autogiro principle.

For more than ten years, engineers have been concentrating upon the problem now successfully solved in the Autogiro. The problem itself was clear-cut—to develop a type of aircraft which would be free of the airplane's complete dependence upon high speed for take-off, support in the air, and landing—hence immune to serious consequences from motor failure or from loss of headway through what ever cause. Freedom from the airplane's requirements of huge, prepared landing fields would follow as an inevitable result.

The Autogiro's success is the result of well-known and long-established principles in a distinctly new method of application.

Both airplane and Autogiro are sustained in flight by forces resulting from the rapid movement of the lifting surfaces through the air (wings in the case of the airplane, rotorblades in the case of the Autogiro). The one essential difference between them is this:

The airplane's wings are fixed. Their movement through the air is therefore solely dependent upon the forward speed of the entire craft. On the contrary, the movement of the Autogiro's blades is independent of the speed of the craft itself. The speed of the blades' rotation is practically constant, whether the Autogiro is travelling fast or slow, hovering or descending. It is not affected even by motor failure.

To this one all-important difference are traceable all the Autogiro's distinctive characteristics—its ability to stop in the air, hover momentarily, descend vertically and slowly, rise sharply; its immunity to spins or other critical situations; its ease of control and maneuverability.

The Autogiro Company of America is not a manufacturing or selling company. It is solely an engineering and licensing organization. It owns and controls, exclusively, all Autogiro patent rights in the United States. Manufacturing companies of high standing will be licensed to build Autogiros with the full co-operation of our engineering staff.

Present licensees are: Buhl Aircraft Company, Detroit, Mich.; Kellett Aircraft Corp., Philadelphia, Pa.; Pitcairn Aircraft, Inc., Willow Grove, Pa.



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Below are excerpts from two of them:

Mr. T. H. Worthington writes that he got a job as soon as he graduated. In writing about the incident he says—"Just as soon as I stated I graduated from Von Hoffmann Air College, I noticed they took more interest in me.

Mr. Richard McDougall, another graduate who is now an instructor in another school, writes— "When I told them I graduated from Von Hoffmann they gave me the job."

Located on the famous \$2,000,000 Lambert-St. Louis Municipal Airport

### VON HOFFMANN AIR COLLEGE

440 Lambert St. Louis Municipal Airport, St. Louis, Mo.

U. S. Department of Commerce approved School for Transport, Limited Commercial, and Private —Ground and Flying. THEN you can be certain of your ready acceptance into this modern industry. For the type of training you get — its thoroughness and completeness are scrutinized very closely. Aviation is looking for capable men. But positions of responsibility require men who have learned every phase of each problem they will be called upon to face.

The practical training given at Von Hoffmann has proved itself repeatedly. 97% of all of our flying students pass Government tests on first trial. That is a record you cannot overlook.

The Von Hoffmann Air College is one of the few schools in the country with the highest Government rating. This rating was awarded only after the Government made a careful study of our equipment, instructors, and system of training. It is your guarantee of the best training.

If you are over 16 years of age send in the coupon below and we shall send you full particulars.

| _ |                                                                                                        | _ |
|---|--------------------------------------------------------------------------------------------------------|---|
|   | VON HOFFMANN AIR COLLEGE<br>440 Lambert-St. Louis Municipal Airport<br>St. Louis, Missouri. MAIL TODAY |   |
|   | Name                                                                                                   |   |
|   | Address                                                                                                |   |
|   | City State                                                                                             |   |
|   | Age I am interested in                                                                                 |   |
|   | ☐ FLYING COURSE ☐ MECHANICS COURSE                                                                     |   |
|   | ☐ WELDING COURSE ☐ HOME STUDY                                                                          |   |



event. Not a dazzling dress parade, but a proving grounds for the

tion to blimp, autogiro and amphibian novelty races, glider flights, parachute jumping contests, aerobatics and other innovations, inclusive of nightly flying exhibitions, will all contribute to the establishment of new standards of stability, safety, endurance, speed and serviceability, towards the end of eradicating the layman's notion of the hazards of flying.

A hearty welcome is extended you to be present as well as participate in this eleventh annual air classic. Complete details on request, Write Clifford W. Henderson, Managing Director.

### NATIONAL AIR RACES

Hotel Cleveland, Executive Offices

CLEVELAND OHIO

# LEADERS HAVE DECIDED...



Universal acceptance of the Continental A=70 — 165 h. p. aircraft engine has made it the leader in its field. More Continental engines are being installed

by manufacturers as standard equipment in this power range than any other engine made. » BECAUSE—
It is the lightest aircraft engine on the market. » Its comparatively small overall dimensions permit a wide range of installations. » Army, Navy, and

manufacturer tests have demonstrated its ability to stand up under rough treatment and hard commercial usage. » It carries the reputation and

undivided responsibility of the famous Red Seal of Continental.

Continental A=70 Second Series
7 cylinder Radial Engine.
165 h. p. at 2000 r. p. m.

CONTINENTAL AIRCRAFT ENGINE COMPANY General Office and Factory, Detroit, Michigan

Continental Engines.



# **TOOK THE WINNIE**

NEW YORK, N. Y. July 7th, 1931

Mr. August Goldsmith, President, The B. G. Corporation, 136 West 52nd Street, New York, N.Y.

Dear Mr. Goldsmith:-

We wish to take this opportunity to advise you that we were very pleased with the performance of the B. G. Spark Plugs which we used in our Lockheed plane, the Winnie Mae, on the Round-the-world flight.

They functioned perfectly, and we are very glad that we had them on the engine.

Sincerely,

Cable Address: Golsteco, New York

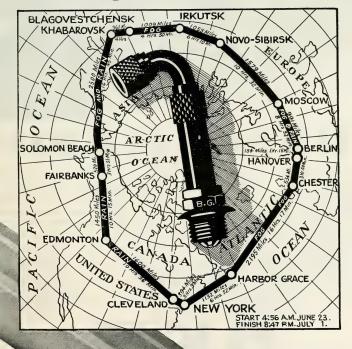
136 WEST 52nd STREET.

B. G. 4B-1 Radio Shielded Spark Plugs were used by Wiley Post and Harold Gatty on their 10:1 Super-charged Pratt & Whitney Wasp Engine during their record-making flight round-the-world. At the end of the flight, 108% flying hours, the plugs showed a maximum gap of twenty-seven thousandths of an inch......

The plugs functioned perfectly throughout the entire flight. Post and Gatty covered approxi-

mately 15,000 miles at an average speed of more than 138 miles per hour, and flew through temperatures ranging from hot to cold, and through weather changing from fair to misty and from heavy rains to peasoup fogs. . . . . . Short and long wave radio reception within range of their instruments was possible at all times without interference.

# MAE 'Round the World



# CORPORATION

NEW YORK, N. Y.

Contractors to the United States Army and Navy

# CIRCLING THE GLOBE



## WITH 5KF IN 8 DAYS

AROUND the world in eight days...one-tenth the time Jules Verne visioned! This lopping off of time through the modern miracle of aviation is a far cry from the trip Magellan, a brave navigator made over 400 years ago, circumnavigating the globe in 1083 days. Riding with the Lockheed Vega on its epochmaking flight were SEF Bearings...a grueling test of men and equipment. Through millions of revolutions, SEF snever faltered but proved, once again, that SEEF Performance takes Preference Over Price in the air.

Fifty-nine SESF Bearings are used in Pratt & Whitney Wasp commercial engines of the type on the "Winnie Mae." The same smooth operation, ruggedness and stamina, the feeling of security and dependability which SESF Bearings bring to famous flights is known by leading manufacturers in theworld's outstanding industries. Where quality and known performance are the standard of acceptance, there can be no substitute for SESF Bearings.

SKF INDUSTRIES, Inc., 40 E. 34th St., New York, N.Y.

2719

# SKF

# BALL AND ROLLER BEARINGS

# KENDALL HAS THIS

### 4000 MILES DAILY FOR PITTSBURGH AIRWAYS WITH AN UNBROKEN RECORD OF LUBRICATION EFFICIENCY



ODERN transport companies have found by actual results over long periods that Kendall Oil keeps motors on the job, planes in the air and schedules on the clock. That is the kind of service

that tells its story on the profit side of the ledger of the transport line.

Mr. Theodore Taney, Vice-President of Pittsburgh Airways, Inc., gives an example of Kendall performance that will make profitable reading for airline operators everywhere:

"This Company has been operating between Pittsburgh and New York for the past two years, and during that time we have never had any sort of motor trouble directly traceable to lubrication.

We have never used any oil but 'Kendall' and have found it most efficient and reliable under varying weather conditions. During the Summer our temperatures run from 70 to 95 degrees and in the Winter as low as 20 degrees below Zero. Your oil does its work regardless of the heat or cold.

Our daily mileage at the present time is slightly over 4000 miles, but we have the same confidence in Kendall Oil, and feel that it will go far towards making Speed with Safety a reality."



The Bradford Grade of Pennsylvania crude oil, from which Kendall is refined exclusively, commands a premium price-for good reason. Kendall Oil will give a full thirty hours of flying service without the necessity of change-by merely maintaining the oil level.

For complete details on Kendall Oil and a list of airports where it is sold. address, Kendall Refining Company, Bradford, Pennsylvania.



REFINED FROM 100% BRADFORD GRADE OF PENNSYLVANIA CRUDE

Reliability

Simplicity

Economy

ANNOU

The NEW AEROMARINE

for light

THE long experience of the Aeromarine organization in the construction of dependable power plants for aviation is concentrated in their latest product, the AR-3. With no appreciable increase in weight, it will give to the light plane owner a more bountiful supply of power than was heretofore possible to obtain, with plenty in reserve to call on in time of emergency. Compact, powerful and rugged "to the core," the AR-3 makes an ideal engine for the one- and two-place training and sport airplanes which are so popular today. The AR-3 recently completed a fifty-hour test run under the supervision of the Bureau of Standards, demonstrating its smooth flow of 50 h.p. at 2100 r.p.m. The AR-3, because of its extra horsepower and smoothness, will broaden the use and raise the performance of lower powered light planes, providing their owners a new conception of sport or student flying.

## **Smoothness**

Light Weight

Long Life

NCING

50 h. p. Ar-3 engine

airplanes



| n                                             |
|-----------------------------------------------|
| Bore                                          |
| Stroke4 in.                                   |
| Piston displacement 160 cu. in.               |
|                                               |
| Compression volume ratio5 to 1                |
| R.P.M                                         |
| H.P50                                         |
| 116                                           |
| Weight with exhaust stacks 156 lbs.           |
| Weight per h.p                                |
| Fuel consumption—cruising, actual,            |
|                                               |
| 2 to 21/ <sub>2</sub> gals. per hr., 30 to 40 |
| miles per gal.                                |
| Oil consumption-1/2 pt. per hr.; 1400         |
|                                               |
| to 1500 miles per gal.                        |
| Overall diameter                              |
| Overall length, without starter               |
|                                               |
| 23 15/16 in.                                  |
| Distance mounting ring to prop13 in.          |
| Diameter mounting ring bolts 121/2 in.        |
|                                               |
| CarburetorStromberg                           |
| Magnetos2 Bosch or 2 Scintilla                |

Now is the time to know the complete details of this remarkable, light-weight, 50 h.p. engine for light airplanes. Your inquiry will bring a prompt reply. Write, wire or 'phone.

CO. Inc., Keyport, New Jersey



### A PLANE FOR EVERY PURSE AND PURPOSE

Approved by the Department of Commerce

T HE complete American Eagle-Lincoln line offers the prospective plane owner a wide choice of plane models and power ratings — all approved by the Department of Commerce.

The feature models of this line include the Kinner powered A.P. Cabin, the Kinner powered P.T.K., and the popular Szekely powered Eaglet. Other models of the American Eagle-Lincoln line are manufactured under fifteen Approved Type Certificates on order.

These modern planes cover all the flying needs of sportsman pilots, traveling salesmen, students, flying schools, private operators, etc. A steady production schedule insures immediate delivery and low prices.

These planes, in daily operation for years by private owners and others, are demonstrating the soundness of American Eagle-Lincoln engineering, construction, materials and factory methods.

An interesting dealer and distributor proposition awaits those who have the qualifications we require to carry the American Eagle-Lincoln reputation into new fields. Fully protected territories, ample service facilities, conscientious sales and factory cooperation, plus an attractive margin of profit make our franchise one of the most desirable to be had.

If you cannot call personally, write or wire. Complete details will be sent you at once.

### AMERICAN EAGLE-LINCOLN AIRCRAFT CORP.

The A. P. (All Purpose) Cabin, Accredited Type Certificate Nos. 373 and 372, \$3995 with 100 h.p. Kinner. \$4395 with 125 h.p. Kinner.

Fairfax Airport, Kansas City, Kansas

The P. T. K. Training Plane. Approved Type Certificate No. 279. \$2565 with 100 h.p. Kinner.





AUGUST, 1931

## FAIR WEATHER or FOUL



### . . all the same to SOCONY

DAYS when the ceiling seems "sky-high," and dirty flying weather are all the same to Socony. That's because Socony Aviation Gasoline and Socony De-Waxed Motor Oil are proved and perfected, not alone in laboratories, but under actual flying conditions.

We operate our own flying laboratory—the Socony Test Plane—to test continually for your benefit all kinds of gasolines and motor oils for airplanes. As a result of these tests, we have produced Socony Aviation Gasoline and Socony De-Waxed Motor Oil—products air-tailored under the actual flying conditions pilots encounter. Next time, try this combination in your ship.

## SOCONY

AVIATION GASOLINE . DE-WAXED MOTOR OIL

STANDARD OIL COMPANY OF NEW YORK

N addition to greater safety and new conceptions of comfort, Tomorrow's air transport must provide maximum speed to promote increased patronage and lower operating costs.

The Burnelli type of air transport design meets Tomorrow's demands in generous measure. It combines the high aerodynamic efficiency of the single engined airplane with the increased safety and capacity of the conventional multi-motored type — providing speed with space.

The following fuselage comparison demonstrates the advantages of the Burnelli type as a high speed passenger and express carrier with a high speed single engined design. Both planes in the following comparison carry equal load per horsepower, use the same wing section, have the same landing speed, equal propeller tip speed and are equipped with retractable landing gear and tail wheel.

|                           | High Speed    |             |
|---------------------------|---------------|-------------|
|                           | Single Engine | Twin Engine |
| Horsepower                | 425           | 1.200       |
| Gross Weight,             |               | 13,300      |
| Frontal area of fuselage. |               | 10,000      |
| square feet               |               | 50          |
| H.P. per square foot o    |               | 50          |
| frontal area              |               | 24          |
| Cargo space, cubic fee    |               | 550         |
| H.P. per cubic foot of    |               | 550         |
| cargo space               |               | 2.12        |
| Drag coefficient of body  |               | 2.12        |
| ideally faired            | V., 00014     | 00000       |
| ideally faired            | . KX .00016   | .00022      |
| Engine with cooling sys   | V 00030       | 00000       |
| tem                       | . KX .00030   | .00030      |
| Lift coefficient of body  | .Kx 0         | .0020       |
| Equivalent wing area      |               |             |
| saving, square feet       |               | 140         |
| Equivalent resistance     |               |             |
| saving, flat plate        |               | 1.22        |
| Resulting comparative     |               |             |
| body resistance pe        | r             |             |
| 100 H.P. equivalen        |               |             |
| flat plate                | 305           | .290        |
| Percentage of engine      |               |             |
| power required by         | y             |             |
| body at 190 m.p.h.        | . 28%         | 21%         |
| Engine power required     | d '-          | . , 0       |
| at 190 m.p.h. per 10      | 0             |             |
| cubic feet of carg        |               |             |
| space                     |               | 46          |
|                           |               |             |

Details of the Burnelli transport and Burnelli High Speed type will be sent on request.

### UPPERCU-BURNELLI CORPORATION

Keyport, New Jersey





with INCREASED CARGO SPACE

# PARKS TRAINING Means earning-power in ONE-YEAR.

H OW SOON do you want to stand on your own feet? Training for many professions requires four years—in some cases six or eight—and then you'll just be ready to start at the bottom of the ladder. Men who enter aviation today will be from three to seven years ahead of you—because complete aviation training can be had in one year, and you're ready for a real job as a Transport Pilot at the end of that time. 14 Parks' graduates in June and July got jobs upon completion of their courses.

Can you name any industry that will double its size in the next five years? Aviation has an excellent opportunity to multiply itself twenty-fold in that time. And only a new and rapidly expanding industry advances its men purely on merit.

Parks Air College is not an easy school. Standards are high—work is hard. Only so can full training be fitted into twelve months. If you've got grit and ambition—if aviation means all the future to you—then Parks welcomes you! Come now—just twelve months and you'll be ready to begin your life's real work.

Mail the coupon for "Skyward Ho!", the Parks catalogue.





### WHEN YOU FLY THE REARWIN "JUNIOR"

Don't worry about fuel shortage, rough fields, hard landings or strong winds. Enjoy yourself, for the "Junior" is built to meet them all.

TRAVEL far in the Rearwin "Junior" without stopping often for gas. Its tank, with a 12 gallon capacity, is unusually large for a plane of its size and it gives you a convenient, wide cruising range.

Land almost anywhere you want to. Pick out a fair sized field-it doesn't matter if it's bumpy. The Rearwin "Junior's" landing gear is six feet wide, wider than most low-priced planes, by two feet. Also, in addition to semi-air wheels, the "Junior" is equipped with smooth riding shock absorbers.

Don't stay on the ground just because it is a bit breezy. You can land the "Junior" in a 25 mile wind as well as in 5, because it is weighted with more than 100 pounds on the tail skid.

> With 45 H.P. engine......\$1795

Department of Commerce Approved Type Certificate No. 434

REARWIN AIRPLANES, INCORPORATED FAIRFAX AIRPORT KANSAS CITY KANSAS

You can see in all directions when you fly this modern approved type airplane. A cutaway center section permits forward and up visibility, the same as in military aircraft and high-priced commercial ships.

Take a 250 pound passenger along if you like. The "Junior" has plenty of power and large enough cockpit accommodations. The cockpit is accessible through a wide door unobstructed by cross members.

We have a profitable tie-up for some wide-

our proposition. Your

inquiry by wire, let-

ter or phone, will

bring a prompt reply.

a w a k e, dependable dealers. This is the time to investigate

### CONSIDER THESE Wine spars of spruce. Center

section leading edge of formed spruce covered with birch plywood. Trailing edge of formed sheet duralumin. Wing tips of covered steel tubing. Wing of covered steel tubing. Wing fittings cadmium plated, Welded chrome molybdenum and carbon steel tubing. Length 21 feet 8 inches. Span 36 feet. Height 7 feet 6 inches. Cutaway center section, dual controls, fullsize two-place tandem cockpit, semi-airwheels, shock absorbers, perfect streamline, rich finish, customary instruments, 72-inch landing gear. Space for luggage. Stabilizer adjustable from both seats. Cent-a-mile operating cost.

## For Sale

10 CURTISS FALCON AIRPLANES

11 DOUGLAS M-4 AIRPLANES

Complete with Night Flying Equipment and Radio

### Suitable for Carrying Mail and Express

DOUGLAS M-4

CURTISS FALCONS

\$3000.00 each \$2500.00 each



Engine

Pay Load

Capacity

Oil Tank

Maximum Speed

Cruising Speed

Main Gas Tank

Gas Consumption

Gravity Tank

Rate of Climb

Wing Span

### Description

Complete with Liberty Engine, Hamilton Standard propeller, Bendix Brakes, Eclipse Inertia Starter, all night flying equipment, all instruments, radio receiving set. These airplanes have been completely reconditioned, licensed and are in daily service on our mail routes. This equipment is offered for immediate acceptance subject to prior sale. Inspection may be arranged at Newark, N.J., Cleveland, Ohio, Chicago, Illinois, Kansas City, Missouri, and Dallas, Texas.

### Falcons

38 FT.

Liberty Liberty 145 MPH 130 MPH 115 MPH 110 MPH 800 LBS. 1000 LBS. 54.4 CU. FT. 60.6 CU. FT. 120 Gal. 120 Gal. 10 Gal. 15 Gal. 25 Gal. per hr. 25 Gal. per hr. 12 Gal. 12 Gal. 480 FPM 500 FPM

Douglas

45 FT. 8 IN.

### Dept. of Com. License Nos.

| NC-209-E | NC-212-E | NC-258-H | NC-1061 | C-164 |
|----------|----------|----------|---------|-------|
| NC-112-E | NC-255-H | NC-8670  | NC-1063 | C-791 |
| NC-208-E | NC-256-H | NC-1645  | NC-795  | C-793 |
| NC-210-E | NC-257-H | NC-1649  | C-3881  | C-794 |
|          |          | NC-1001  |         |       |

### NATIONAL AIR TRANSPORT, Inc. 5936 South Cicero Avenue, Chicago, Ill.

Other surplus equipment including engines, propellers, miscellaneous equipment, engine parts, etc., are being offered for sale at attractive prices. Write for complete list.

### DALLAS AVIATION SCHOOL & AIR COLLEGE DALLAS, TEXAS

Where it is easy to learn to fly and where you get better training for less money

### What an Expert Says:

Mr. Cloyd Clevenger, author of 'Modern Flight' and an author-ity in matters of avia-tion says: "You have the best school in the United States and I am United States and I am glad to recommend it to anyone who wants t learn to fly." And Mr Clevenger knows.



Air view taken the day of Amelia Earhart's visit with her Autogiro

#### Special Offer

We will surnish board and room for part time work to any student who desires it, with any course we offer. Work will be in shop, hangars, repair station, etc., and you will be earning while learning. Write or wire for reservations now.

### NEW REDUCED PRICES AND THE BEST OF EVERYTHING

### Why Pay More?

When you can get your training where everything is in your favor: good weather, low prices, best flying equipment. You will not be disappointed here. You might elsewhere.

### Roard and Room at the School

at \$8 to \$10 per week. Everyone connected with the School lives here. Love Field now has 250 acres and is one of the best airports in the entire country.

### Good Bus Line

to and from city, 18 hours a day, and fare is only ten cents.

### Refresher Courses

Write us for prices on any number of hours you need.

### New Catalog

Just out—contains complete infor-mation and details of courses. Wire at our expense if you are in a hurry.

### TRANSPORT COURSE-\$2500

200 air hours-50 dual, 150 solo. Time to complete course, 5 to 6 months. 400 hours classroom and ground instruction. 10 hours night flying. 15 hours four-place cabin flying. hours trimotored Ford. 3000 miles cross-country trips in different types of ships.

And to those enrolling before October 1st, 1931, for the course

50 HOURS FREE in extra experience in flying after you get your license

### LIMITED COMMERCIAL COURSE— \$795

50 air hours-25 dual, 25 solo. 3 types of ships. 500 miles cross-country trips, 250 hours classroom and ground instruc-Instruction given in Fleet, Swallow and Stinson tion. Junior.

### PRIVATE PILOT'S COURSE—\$385

20 air hours—12 dual, 8 solo. We use Fleets for this course. No better ship built for training. You will know how when you finish this course.

### MASTER MECHANIC'S COURSE—\$350

20 weeks intensive classroom and shop training; 25 hours welding, aircraft rebuilding and repairs.

### What We Have Here for You

- 3 large hangars
- 2 classrooms
- 3 shops
- parts and supply station cafe—2 dormitories
- Over 25.000 feet of floor space trimotored Ford, 14-place . Stinson Junior, 4-place cabin Fleets, 2-place

- Swallows, 2-place
- Eaglerock J-6-5 Rearwin—150 miles an hour
- 1 Curtiss Robin, 3-place

and other ships for sale only.
All our ships have radial, aircooled, double ignition motors.
We do not have any OX-5's
or wartime motors or ships.

### We Pay Your Railroad Fare

From your home to Dallas on Transport and Commercial Courses and one-half railroad fare on all other courses. Come by train, drive through, or any other way. It's all the same.

This School is Government Approved and has Transport Rating

### DALLAS AVIATION SCHOOL & AIR COLLEGE

DALLAS, TEXAS

### AIR TRANSPORTATION

# \* DEMANDS \* GREATER SPEED

Speed is progress. For that reason the horse replaced the ox; railroads and automobiles the horse, and fiveday boats drove white sails from the seven seas \* Speed is the only reason for aviation. The transport operator must realize this. He must provide the speediest of all transportation. If he does not the world will go back to trains and motor cars.

Speed is the reason for the rugged construction-the stream-line design the ample power (575 h.p.) of the Model 17 FLEETSTER . . . and its cruising range of 750 miles at 153 miles an hour \* The Model 17 FLEETSTER was planned to meet the demands of the air traveler for speed and comfort. With ample baggage space, this eight-place, convertible landplane or seaplane will make money where a less speedy, reliable or popular plane, though larger. would carry a partial load at a loss. Proofs of the stability, safety, economy and performance of the Model 17 FLEETSTER for transport service or private ownership will be sent on request to anyone interested in economical air transportation.

MODEL 17 . . . A.T. C. 369





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MODEL 20 . . . A.T. C. 320

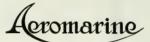
A IR-PASSENGERS' demands for speed are incessant-but those of the airmail and express service are imperative . . . Business is won-or lostthrough success or failure in maintaining rigid schedules \* High speed and suitable cargo capacity alone can make air transportation profitable and popular. The Model 20 FLEETSTER is amply powered for its cruising range of 700 miles at 148 miles an hour . . . It arrives on time. Every cubic foot of its payload capacity serves a useful purpose. The pilot's rear cockpit permits the most efficient adaptation and arrangement of its useful load (2461 lbs.) to individual requirements for passenger, mail and express accommodations \* The Model 20 FLEETSTER is more economical in operation and maintenance than any similar plane of its type. Every factor of its appeal to progressive transport operators is worthy of consideration by corporation executives whose widespread activities demand speed in the transportation of cargoes or personnel. Write for facts regarding the Model 20 FLEETSTER for all transport purposes.

\* AIRCRAFT \*
CORPORATION
BUFFALO, N. Y.



## FREE FLYING INSTRUCTION

to All Purchasers at Established Flying Fields on



### THE PIONEER LOW-WING MONOPLANE

LOW WING-LOW CENTER OF GRAVITY-LOW FIRST COST-LOW UPKEEP-LOW OPERATING COST

## Model 70 Trainer \$2500

A.T.C. 204

FORMER PRICE \$3550

### Model 85 Flyer \$3300

A.T.C. 334

FORMER PRICE \$3700

Discounts to Dealers and Field Operators

Equipped with Airwheels, Instruments, Navigation Lights-F.O.B. Factory, Keyport, N. J.

### REAL PROFITS IN FLY-IT-YOURSELF SERVICE

### SPECIFICATIONS

|                    | "85"      | "70"      |
|--------------------|-----------|-----------|
| Power-LeBlond      | 85 H.P.   | 70 H.P.   |
| High Speed         | 100       | 93        |
| Landing Speed      | 38        | 38        |
| Cruising Speed     | 85        | 80        |
| Climb at Sea Level | 700       | 600       |
| Cruising Range     | 5 hrs.    | 6 hrs.    |
| Fuel Capacity      | 29        | 29        |
| Oil Capacity       | 2 gal.    | 2 gal.    |
| Weight Empty       | 1016      | 1025      |
| Useful Load        | 574       | \$65      |
| Gross Weight       | 1590      | 1590      |
| Wing Loading       | 8.2 lbs.  | 8.2 lbs.  |
| Power Loading      | 18.7 lbs. | 22.7 lbs. |

200 hours without engine overhaul. 500 hours without a cent spent on the airplane. \$5.488 earnings in three months with

one ship.
Over \$13,000 in one season with two

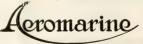
\$1,800 in one month with one ship.

These are some of the actual reasons why we say field operators do make money, flying AEROMARINES in school and fly-it-yourself service. You cannot overlook this ship if you intend to make field operations pay.

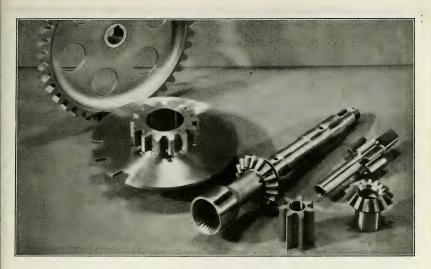
### SALMSON MOTORS

There are still available a few brand new Salmson AD9, 40 H.P. motors, which originally cost \$1118 each delivered, at \$560 each, f.o.b. Keyport. Used motors of the same type, \$370 each. Maintenance parts available at all times.

W. L. DILL, RECEIVER FOR



KLEMM CORPORATION KEYPORT, N. J. AUGUST, 1931 23



# "Ex-Cell-O Precision" is available in Aircraft Engine Parts

Years of experience in the handling of this particular type of product; the most modern and efficient plant equipment; and a personnel composed of specialists in each field of production, have combined to make the name "Ex-Cell-O" a synonym for precision!

Ex-Cell-O's plant equipment provides facilities for complete production from raw materials to finished parts. The Ex-Cell-O aircraft booklet will be mailed upon request.

# EX-CELL-O

AIRCRAFT & TOOL
CORPORATION

1200 OAKMAN BOULEVARD



DETROIT, MICHIGAN

# Announcement of Great Importance to American Aviation

-- A New Home for

# The Sonocoupe Registered Trade Mark

A FTER August 1, 1931, the Monocoupe will be manufactured at Lambert Field, Robertson (St. Louis), Missouri.

New facilities, new organization strength now embraces the old Monocoupe group and adds the necessary forces to entrench America's first plane for the private owner in its position—undisputed leadership.

The Monocoupe dealer franchise will now be of greater value than ever before. Get the details of this dealer proposition for your own community.

### Attention! Monocoupe Owners

We have purchased the Lambert Aircraft Engine Company and will operate this company as the Lambert Engine & Machine Company, Moline, Illinois. All Lambert engine service will be handled in Moline. All service on airplanes will be handled at Robertson, Missouri.

## Monocoupe Corporation

Successors to

MONO AIRCRAFT CORPORATION

LAMBERT AIRCRAFT ENGINE CORPORATION

LAMBERT FIELD

ROBERTSON, MISSOURI



SAVED! Mildred Kaufman, at Buffalo, N.Y.'30

SAVED! V. Pesarenko, U. S. S. R. (Russia) Aug. 20, 1928.



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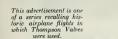
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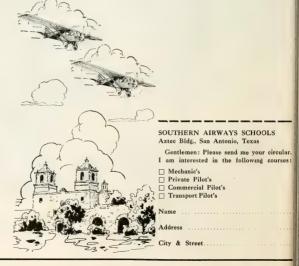
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No. 2

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AERO DIGEST



Grand Central Air Terminal, Glendale, California, illuminated for night operations

## ARCHITECTURAL PRINCIPLES APPLIED TO AIRPORT DESIGN

H. Vandervoort Walsh

Assistant Professor of Architecture, Columbia University

If I say that an airport must be practical and operate efficiently, I am sure that no one will disagree with me. If I say that such is the first and fundamental requirement of a good architectural solution for an airport, engineers probably will reply that such may be the case, but that few architects can make them practical, for somehow engineers are inclined to believe in a caricature architect who rants about delicacy of curve, charming proportions and lovely color combinations, disregarding all other considerations. I suspect most engineers believe that the correct method of designing an airport is to let them lay the whole thing out, insuring its practicability: and then, if there is any money left, to call in an architect to spread a little trimming around on the outside of the buildings to make them look pretty.

The difference between an engineer's point of view on airport designing and that of an architect is that the engineer is convinced he can design the whole project without the architect's opinion whereas the architect knows he cannot design one until he has first consulted the engineer. The engineer is ostensibly right in his conviction. Airports can be designed and built solely by engineers, and they will probably work very well. But airports, like railroad stations, are used by human beings who demand more of a building than mere practicability. Administering to the physical needs efficiently is a necessary part of airport design, but we should administer also to man's mental needs by arousing in him the proper emotional reactions. Mere physical comfort is no comfort at all, if the mind is ill at ease. One can be physically comfortable in a scientifically designed dentist's chair, surrounded by the most sanitary conditions possible, yet few human beings would select such a chair or surroundings as an aid to mental comfort. Likewise flying will never become generally popular until airports become more than merely practical and safe. They must affect the human emotions, establishing a mental state of ease through a feeling of comfort, safety and other emotions producing pleasure. The demand for fine appointments in the cabin of the modern airplane is proof of my point.

The well-trained and capable architect who by nature is endowed with the intuitive sense of emotional reactions produced by forms and colors is the only one able to add the intangible quality to airport design that will give mental comfort to those who desire to travel by air and who must wait at the airport until time for departure. This "plus-quantity" which he can add to the utilitarian considerations will have quite as much to do with building patronage of the port as will its reputation for speedy, efficient service. But this added quality beyond the mere functional requirements is not something that can be plastered on the outside like so much fancy pastry. It must be a part of the whole conception, a system of thought running under the entire arrangement of all parts. Elegance and a fine sense of mental

comfort cannot be produced by surface effects; they must come up out of the very core of the structure. Architecture and engineering must go hand in hand from the very inception of the project for an airport.

The very first architectural principle that must be applied to airport design is the necessity for organizing all of the buildings and the landing field into one unified scheme, that it may appear to be simple and not complex. To the mind, such unity is intimately linked with symmetry. The human body with all its complicated parts, far more intricate than any airport will ever be, is unified by being balanced around a central axis, with a single control unit, the head, at the top. To every human being this is the symbol of unity, and we see it repeated throughout all nature in animals, birds, fishes, flowers, and plants. Even in the design of an airplane to conform to the laws of nature, symmetry had to be followed. Of all the mechanical things we have invented, the airplane with its streamlined form is the most beautiful, because it reflects most in its structure the universal laws of unity; yet in grace and refinement of line even the hardest eye must admit that it falls far short of the bird with extended wings. Out of the very essence of flying, it would seem that of all the buildings in the community, the airport should be the



Artistic and practical building at Los Angeles Municipal Airport



Passenger station at Grand Central Air Terminal, Glendale, Cal.

one most symmetrical, most symbolic of the unity required for safe flight.

Symmetry means balance about a central axis, but there is also a subordinate axis, at right angles to the main one, about which balance must be maintained. In the airplane this is the axis of the wings. For simplicity and unity, the mind demands that in a fine composition of a group of buildings all elements must be balanced about the two axes.

Along the central axis, about which everything on the left balances with everything on the right, the story of the most important functions of the building or group must be told in the simplest manner. In an airport the story to be told is essentially this. Human beings approach the entrance in automobiles or on foot, walk in and wait to buy tickets and arrange for baggage, then move on to the planes that wait to take them, and finally the planes move out to the field to fly up and away. This simple story must be evident by the very form of the building and should be so clear that none of the subordinate activities will detract from it. On the central axis therefore should come the main entrance, then a passage leading directly into the waiting room, the doors leading to the planes and finally the flying field beyond. The waiting room, as in the railroad station, should be large enough and elegant enough to give mental comfort to those who must spend time in it.

Subordinate to the main requirements must be all others, which should be arranged in balanced order along the secondary axis,-administration facilities, accommodations for personnel, restaurants, concessions, rest rooms, first aid quarters, radio, telegraph and telephone rooms, storage building for planes, repair shops, and the like must be disposed in a symmetrical manner about the secondary axis. Those nearest to the center should be the units which administer most to the human beings passing through, and those farthest away the places where the passengers have no business at all.

To take all of the many elements, especially if they are very complex, and unite them into one organized scheme on this simple theme and at the same time not disturb too much the practical and functional relationship between parts is an extremely difficult problem, requiring a method of study that keeps the planning in a constant state of flux until arrangement and proportion begin to develop on satisfactory lines. Practically no engineers have the training which architects have in the technique of keeping the planning in a very plastic condition, capable of quick changes as new and better ideas pass through the mind. Without this method of study, elegant proportions, fine arrangement and dignified planning are next to impossible to obtain. When the final solution is reached in which all elements are brought together into one fine and simple scheme, the form of the structure that can be developed around such a plan will have one of the first requirements of pleasing appearance-that of unity.

While the plan is being formed, the architect must visualize the general exterior forms of the buildings, so that the masses which they take relate to each other and produce a scheme that, whether seen from a distance or near by, appears as one unit. There must be a central or dominant building mass, about which the smaller buildings are grouped and to which they seem subordinate. The open spaces around the buildings must be proportioned to the structures, so as to increase their dignity and prevent them from appearing to be small and loosely scattered. Thus the work of planning is more than merely solving the function, more than making the building construct economically and operate efficiently. The problem is bigger than all of

(Continued on page 128)



Terminal Building, Fairfax Airport, Kansas City, Kansas

## CIVILIZATION C. O. D.

#### By Don Rose

INETY-nine people out of a hundred think it's a smart idea to allow Germany a year's leeway on the war debts. Nearly the same number have no exact idea what a debt moratorium is all about, except that the Republicans thought of it first and the Democrats don't know quite what to do about it. Two out of three couldn't tell you whether Germany can't pay, won't pay or shouldn't pay, and the third isn't sure.

That, I suppose, is no more than natural. The war is already ancient history to a considerable slice of the population. It is seventeen years since somebody dropped a match into the powder box and blew the peace of Europe to blazes, and many of the venerable voters of today were toddling around the kindergarten at the time. Furthermore, the war and its causes and consequences was a considerable mess, which will take a century to sort out to everybody's satisfaction, by which time it won't matter. And if the war was a mess, the peace that followed it was a muddle of the same proportions. How bad a muddle it was, the world is just beginning to find out.

Germany has found out that it is expensive to lose a war. Her neighbor nations have found out that it is nearly as expensive to win one. The war debts and the worries about them are the economic scar left on civilization by a free-for-all fracas in which everybody got hurt. And the deuce of it is, as the Irishman said, that it's no fun to be paying for a war which you aren't using any more.

Nobody can make much sense of the situation, not even those who created it. Now and then we hear from high places that everything is settled, which would be swell if it would stay that way. The Treaty of Versailles settled it, you remember, and look at the poor thing now. The Young Plan settled it positively, and if you can make the debt moratorium fit into the Young Plan you should be occupying a chair of economics at Harvard or somewhere equally important. Most of the innocent bystanders are now telling the neighbors that the Hoover holiday has wiped out the war and all its works, though they couldn't tell you why. Which will be true until the pants of peace, progress and prosperity need patching again, and that is likely to be soon.

Here, however, is a point worth remembering. If Germany pays the war debt according to treaty and agreement, she won't pay it just once and get over it. She will pay it in interest and pay it again and still owe the money, just as I shall probably pay off the mortgage on the old homestead three times before the sheriff gets it at last. That is the result of buying a big war on the installment plan. And the principle, by the way, applies to winners as well as losers. Believe it or not, but your grandchildren—if any—will still be paying for grandpa's khaki pants when grandpa can't wear them any more.

That's what national debts are for—to unload the extravagance of one generation on another's shoulders and pocket book. I won't stop to tell you how big these debts have grown within this century. I'll call your attention, instead, to how long it takes to pay off the hired help when the party is over. The last war widow of the war of 1812. died this year and was collecting a government pension to the day of her lamented demise. She was once a smart gal who married a veteran just in time to inherit his pension, which has been paid for more than a century by a presumably grateful government. So when you swear at last year's taxes, remember that some of them went to pay for a war which was fought before your grand-father saw daylight.

It is not only by wars that civilization runs up bills for somebody else to pay. Cities and States do the same sort of thing by means of alleged improvements. The financial managers of the United States are proud of the fact that they have reduced the national debt by many hundreds of millions during the past ten years. In the same period the debt of the cities and States has gone up as much as the Nation's debt has gone down. The Census Bureau found out recently that 250 cities have gone deeper in the hole by a total of \$304,000,000 since the last count, and are now carrying a mortgage of \$6,130,289,500. More than ten per cent of city taxes pays for nothing except the interest on these loans. And it's much the same way with the States. Twenty-one of them, in fact, couldn't collect enough from their citizens last year to pay their way. So they borrowed the money. And who, do you suppose, will pay it back?

The point is, friends and customers, that this thing we call civilization isn't paying its way. It is gambling disgracefully on the future—on the patience, thrift and productive economy of a generation which is still in short pants or less. It prides itself on progress, but it pays only part of its price. And it loads the future with carrying charges which may someday seem a little tiresome.

It is the fashion just now to talk of Five-Year Plans and Ten-Year Plans. If a nation finds itself in the soup, somebody proposes a plan to get it back to dry land again. Even President Hoover, you remember, had a Ten-Year Plan for American prosperity. The plan, as I recall it, was that we should make more money, spend more money and have more money. And it's a good trick if we can do it

It is undoubtedly an excellent idea to budget the business, income and expenditures of tomorrow, so far as you can. I suppose that round-the-world fliers, ocean jumpers, and imported pilots visiting the folks in Europe calculate rather carefully the expenses of their trip. It might be embarrassing to set out for the other side of the sea with a 2,000-mile allowance of gasoline and discover next morning that the gas is all gone and you have still a thousand miles to fly. I am, in fact, facing the same problem myself, since I sail for Europe in mid-August and have at present only enough money to reach a point 200 miles this side of Ireland. I may have to stretch my glide quite a lot to reach London.

But this sort of planning is only a process of paying your way, wherever you may be wanting to go. It is not playing the future on margin, nor pyramiding profits which

(Continued on page 107)

## AIR—HOT AND OTHERWISE

Organize in Washington

THE industry must organize if it expects to get what it should have in Washington. The opposition IS organized. Defeat of many important plans made by the Army,

Navy and Post Office in their efforts toward aeronautical expansion has shown what that organization can do, and what, unorganized, we cannot do.

It has not been economy due to the depression which has held down appropriations for the various air services. The Seventy-first Congress, which ended at noon, March 4, broke all records for Federal appropriations if war periods of terrible emergency are excepted.

The Seventy-first Congress spent a little more than ten billion dollars in regular and special appropriations. Yet when the year ended on June 30, neither the Army nor the Navy had been given cash with which to increase its air force to the maximum agreed upon in 1926, when the Five-Year Program was enacted.

Let these facts sink into your system.

President Coolidge in a speech stated that our share of the World War's cost would be one hundred billion dollars, a figure equal to one-half of the national wealth at the time of the beginning of the conflict. The actual period of the war cost us slightly over seven million dollars per hour, if we include pensions, the cost of the Veterans' Bureau, and other expenses of the sort which run on for years after any conflict.

Had we been prepared at the time we became belligerents, or had we been able quickly and effectively to mobilize our industrial forces even ninety days sooner than we did, that would have meant to the taxpayer a saving of fifteen billion five hundred million dollars. History has proved over and over again that preparedness is the most intelligent economy.

During the Army Air Corps maneuvers, Arthur Brisbane made a speech in which he said:

"We in civilian life very properly all hope that there will never be another war. The Naval and the War Departments, however, are not justified in hoping. It is their duty to make plans for prevention of war. Nothing but air defense can protect this country in case of another war."

No sane person wants war. No real national glory can come from the incalculable human suffering armed conflict between nations must occasion. The object of modern war is the destruction not only of the opposing naval and military forces, but of cities, towns, villages, homes, food stores, water supplies as well as human lives (men, women and children) sheltering, supporting and comprising civilian, so-called noncombatant populations.

The world's present burden of taxation is principally due to war, for war's effects do not cease when an armistice is signed. Such starvation (let's be honest), financial disaster and general misery as we are now experiencing are parts of an unprevented war for which we, at least, were not prepared. Not even the killing ends with the battles and their wounds. Burdens passed on to posterity, disorganize, crush,

Frank A. Tichenor themselves into themselves into themselves into themselves into the service of 194.

agonize and also kill. The jobless men and women of 1931 who are worrying themselves into their graves will be just as dead when they are buried and as surely victims of the war as any

soldier killed on the front line. Human individuals not born when the battles were fought will bear some of the vast burden of unprepared America's participation in the war. And there is another thought. Conceive if you can

the vast throng of happy and intelligent children who now might be on earth as offspring of the multitude of youths in this and other lands who would have been saved from death if through mere readiness to fight, the United

it through mere readiness to fight, the United States had been able to exercise a real restraining influence, or being compelled to fight, had been able to fight quickly and with effectiveness.

Well, its up to us.

Gentlemen of the air industry, you have in your hands the instrument which will decide, and quickly, the next war, when another comes despite all the conferences with their talk about disarmament. That power which you possess might even prevent war. Unfortunately it is a human failing to neglect preparations for the worst, while hoping for the best, in spite of the plain lessons of the past. In the case of the American air industry

such neglect seems wholly inexcusable because, while action is essential to the general welfare of this nation and the world, it is specifically necessary to that industry's well-being and prosperity.

Admiral Moffett, in a speech in Washington, May 9, declared:

"Even the American Legion was too busy pressing adjusted compensation to succeed in the accomplishment of anything for national defense. As a consequence the pacifist organizations, by undercover methods of obstruction and delay, had to make little effort in order to defeat the Building Program. The Navy Department asked for a modest program. It was approved by the President, but Congress passed none of it. Why? Because there was no general, organized."

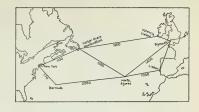
In this proposed program which died the death of sheer neglect by those whose interest it was to further it, were included one flying-deck cruiser which would have required aircraft equipment and one aircraft carrier which would have required still more. To be exact, a total of 280 planes would have been needed for these ships, representing an aggregate business of many million dollars.

Could the aircraft industry have used this business and this money? Ask yourself, if you are of the industry, as probably you are. Think about it. Then remember that the reason why the aircraft industry did not get that business was because it was not organized in Washington to put the matter through the Senate, despite the fact that under the able chairmanship of Hon. Fred A. Britten, the House Naval Affairs Com
(Continued on page 104)



## TRANS-ATLANTIC AIR MAIL

Captain F. T. Courtney



RANS-ATLANTIC air mail will eventually be a reality and it is therefore of interest to look into the factors involved to try to see what is the most likely method of successfully arriving at such a service.

There are several main problems to be faced. Weather, generally believed to be the prime consideration, is merely one factor and probably by the time the trans-Atlantic mail can be a regular service, will be one of the least of our problems. In this sense, I distinguish weather from wind. The effects of wind, we know. It either decreases or increases the operational speed and therefore increases or decreases the effective distance to be covered. It is therefore a similar factor to that of distance. By weather I mean fog, snow, rain and clouds which are mainly problems of visibility and navigation.

For a trans-Átlantic air mail service to be of any real value, it must be of a high degree of regularity and should give a service of not more than forty-eight hours between Europe and the United States. Otherwise, it will be out of competition with the high-speed steamers. To attempt to carry mail until such a service is assured would merely be a waste of money and, what is worse, might discredit the future value of such a service. Clearly, therefore, only experimental runs should be made until such regularity and speed can be relied on. In-beginning, assuming the problems of winter flying to be great, a regular service during the summer months might be operated and gradually extended into the worse periods of the year.

The greatest problem of all is that of load, for the service must be such that it can carry something appreciable in addition to the fuel. In order that such payloads shall be as great as possible, it is necessary to make the jumps as short as possible in order to reduce the necessary load of fuel. The idea of floating air stations placed out in the Atlantic is being tackled but they are experimental and for the purposes of this article are left out of the question.

It seems reasonable to suppose that the type of ship to be used will have to be, for many years at least, the flying boat. It may be later that range and engine reliability will make it unnecessary to consider the necessity of descending into the water. Even so, it must also be recognized that the use of water surfaces will have great value for other purposes than mere emergency landings.

First of all it is essential that we should obtain a plane with adequate range before we can carry out any useful service at all. Even, however, when that range is appreciably increased the situation will remain the same, because any extra load-carrying capacity should be put into payload.

A study of the most likely routes involved is the best

way to illustrate the problems to be faced. The map shows the various routes with approximate distances marked in statute miles. In estimating the speed of trans-Atlantic crossings, many people make the mistake of reading nautical miles on a chart and then figuring them as land miles. The difference is great. For example, the 668 nautical miles from New York to Bermuda are in fact 770 land miles.)

The two stopping points on the main trans-Atlantic routes which set up the most problems are the Azores and Newfoundland. In the Azores the only place with a harbor worth mentioning is Horta. The harbor here is considerably silted up and its effective size is appreciably smaller than one would gather from a chart. By a very considerable amount of engineering work the adjacent waters could be connected and protected to make an excellent flying boat base for practically any weather, but it is not probable that the necessary money would be spent on this for a long time. As Horta is useful only in relatively calm conditions, it would be none too favorable a base for the take-off of flying boats on schedule.

Newfoundland offers many protected waters. It is, it must be conceded, in an area of frequent bad weather; the fogs off the coast especially in the summer, are well-known. However, in the light of necessary developments in aircraft it seems to me that the significance of the reputation of Newfoundland for bad flying weather is exaggerated.

Even at the present time it is becoming increasingly evident that blind flying and navigation methods (in other words, the defeat of bad visibility) will have to be perfected before regular air transport becomes of any definite value over land or over water. Great strides are being made in the perfection of instruments and apparatus for this purpose, and what is mostly lacking is efficient experimental work in the operation of such apparatus. It is reasonable to expect that by the time regular trans-Atlantic flying is feasible the question of finding and arriving at one's destination in little or no visibility will be a much simpler one. Little attention seems to have been paid so far to the fact that Newfoundland has extensive inland water areas which could be extremely well adapted as bases, assuming that such ports as Harbor Grace offer too many difficulties. It can, therefore, be reasonably assumed that bad weather will form much less of a bugbear to the use of Newfoundland for aircraft than appears at the moment to be the case.

It is well-known that the westward route is more difficult than that from west-to-east. Three main reasons explain this fact: First, over the usual routes the prevailing winds are against the westbound plane; second, weather

(Continued on page 119)

## RECENT LONG-DISTANCE FLIGHTS

PERHAPS no long-distance flight has given a more conclusive demonstration of the potentialities of air transportation than that of Wiley Post and Harold Gatty. Indicative of progress in aircraft and engine design, as well as in the science of air navigation, was their circumnavigation of the globe around the Northern Hemisphere in eight days, fifteen hours and fifty-one minutes, or flying time of four days and ten hours. The total distance flown was 15,474 miles, covered at an average speed of 145 miles per hour.

Most significent in the consideration of this flight was the use of a standard commercial model of the Wasppowered Lockheed Vega equipped with extra fuel tanks; and the fact that the crew followed a practically unknown route with problems of weather and servicing to be solved as they were encountered.

It is true that the flight made no important contributions to a knowledge of the endurance of which a plane and engine are capable; rather, past experience of this nature was merely reiterated. Refueling endurance flights had previously demonstrated that, given favorable weather and adequate airport facilities, a plane can remain in the air for more than three weeks. The world's record of twenty-seven days in the air established last year by Dale "Red" Jackson and Forrest O'Brine far exceeds the total elapsed time and actual flying time of Post and Gatty in the Winnie Mae.

However, the Post-Gatty world flight is conceded to be an important and significent one. It showed that a standard plane, equipped with modern facilities for navigation, could travel regions alien to air transport, utilize whatever facilities for repair and refueling were available or had been laid down in remote regions, and fly thousands of miles through unfavorable weather to predetermined destinations, maintaining a fairly accurate schedule.

The Post-Gatty world record is the third to be established by aircraft. In 1924, the United States Army planes circumnavigated the globe in a total elapsed time of 175

days. The Graf Zeppelin flew around the world from Lakehurst to Lakehurst in 1929, setting a record of twenty-one days, seven hours and thirty-four minutes.

Plans for the world flight were developed by Post over a period of four years. Eventually, Post obtained the financial backing of F. C. Hall, wealthy Oklahoma oil operator by whom he was employed as personal pilot. When Hall contributed his private plane for the venture, Post interested Gatty in the flight. Last year they began preparations.

Post is reputed an adept pilot, even though he had lost the sight of one eye while employed as an oil driller. Gatty, an Australian who came to this country in 1927, has long been known as a skillful navigator. It was necessary for the successful completion of the flight that the ability of pilot and navigator function in perfect complement to each other. To accomplish the Northern Hemisphere flight required many hours of flying blind, guided entirely by navigation and flying instruments. Four exceedingly difficult legs of the flight were reported by the crew. The ocean was flown at night, fog being encountered before the landing at Chester, England. The worst weather on the entire flight was encountered on the leg between Berlin and Moscow. At times a low ceiling forced the plane within a short distance of the ground. They flew over wild and remote territory between Irkutsk and Blagovestschensk traveling at times less than twenty-five feet above the trees. Rain and fog were flown through on the water hop from Siberia to Alaska.

The flight began at Roosevelt Field, L. I., on June 23 and was completed on July 1. The log was as follows: New York-Harbor Grace, 1,132 miles in six hours, 52 minutes; Harbor Grace-Chester, England, 2,195 miles in 16 hours, 17 minutes; Chester-Hanover, 534 miles in three hours, 40 minutes; Hanover-Berlin, 154 miles in one hour, 15 minutes; Berlin-Moscow, 991 miles in eight hours, 52 minutes; Moscow-Novo-Sibirsk, 1,579 miles in ten hours, 32 minutes: Novo-Sibirsk-Irkutsk, 1,055 miles in six lines in six processing the six of the six

hours, ten minutes; Irkutsk-Blagovestchensk, 1,009 miles in four hours, 50 minutes; Blagovestchensk-Khar-barovsk, 361 miles in four hours; 50 minutes; Blagovestchensk-Khara-Kharabarovsk-Solomon Beach-Kara-Kharabarovsk-Solomon Beach-Fairbanks, 520 miles in three hours, 55 minutes; Fairbanks-Edmonton, 1,450 miles in ten hours, 15 minutes; Edmonton-Cleveland, Ohio, 1,600 miles in ten hours, 36 minutes; Cleveland-New York, 394 miles in three hours.



(Acme photo

(Left to right) Gatty and Post wish Hoiriis and Hillig luck as fliers meet at Newfoundland

#### New York to Hungary

A FTER more than a year of preparation, the first non-stop flight between the North American Continent and Hungary was successfully completed last month by Captains George Endres and Alexander Magyar, Hungarian army reserve officers. Unique in long distance flights was the purpose for which they undertook the crossing of the Atlantic. It was conceived and executed as an international gesture to attract attention to what Hungary considered unjust treatment accorded her in the Treaty of Trianon.

In the Lockheed Sirius monoplane Justice for Hungary, they started from Roosevelt Field, Long Island, on July 13 and flew to Harbor Grace, Newfoundland for the over-water take-off. With 630 gallons of gasoline and twenty-five gallons of oil, the plane had a total weight of 8,000 pounds. Immediately after the start, on July 15, they encountered a storm and then fog settled over their course. For more than three hours after midnight, winds and rain buffeted their plane. They saw little of the ocean below throughout the entire crossing. Their first sight of Europe was a village in France. Temporarily lost, they swooped low over railroad stations to identify towns on the route. Upon arriving over Hungary, fuel was practically exhausted and was pumped from the reserve tanks.

When they were over Bicske, twenty miles from Budapest, the fuel was entirely consumed. As they were attempting a landing on a roadway in the darkness, two farm wagons obstructed the landing area. The ship swung toward an open field and landed, slightly damaging the propeller and a wing. The fliers were driven to Budapest by automobile and accorded a reception seldom more enthusiastic in the history of such demonstrations.

The pilots flew the 3,600 miles from Newfoundland in twenty-six hours and twelve minutes. Lord Rothermere, British publisher, directed that Endres and Magyar be paid the sum

of \$10,000 which he had posted for the first flight from the United States to Hungary.

Emil Szalay, of Flint, Mich., sponsored the flight.

#### Flight of the Liberty

THE first flight across the Atlantic as a vacation voyage was brought to a triumphant finale on June 26 when Holger Hoiriis and Otto Hillig, both residents of Liberty, N. Y., landed their Bellanca Pacemaker Liberty in Copenhagen, Denmark, having fulfilled the dreams of both to fly back to visit the countries of their birth. Twenty thousand cheering Danes greeted both their countryman, Hoiriis, and Hillig, who is a native of Germany.

The welcoming crowd had been waiting many hours to greet the fliers. They were still waiting late in the evening on the previous day when word arrived that the homecoming voyagers had made a landing at Bremen and were too tired to proceed until the following morning.

The landing at Bremen, 220 miles short of their goal,





(Acme photo)

The Bellanca "Pacemaker" Liberty (top); the Lockheed "Vega" Winnie Mae (center), and the Lockheed "Sirius" Justice for Hungary (bottom)

was a final adverse event for the fliers in their journey of almost a week from their home in New York. After some delay at Harbor Grace, Newfoundland, they took off over a fog-shrouded Atlantic. For seventeen hours, often in the biting cold atmosphere of 12,000 feet, they flew without sighting water. Adverse winds carried them too far to the south of their course and instead of arriving over Ireland they emerged from the fog banks over a country they determined as Spain. Some hours later, with a gasoline supply running low, they descended at Krefeld, Germany.

They refueled and obtained maps for the rest of their flight. However, through a mistake due to the metric system in use at European airports, only fifteen liters of gasoline was filled into the tanks instead of the fifty gallons they required and the fliers were brought down at Bremen for more fuel.

The plane used for the flight was a Bellanca, especially equipped for a long-distance flying. It was powered with a Wright J-6 300 horsepower motor.

## 1931 NATIONAL AIR TOUR

#### Ralph W. Cram

A BOARD Ford No. 5, National Air Tour plane, late in July, 1931. Roaring away from the Southland, across the Oklahoma cotton and oil fields and the Nebraska prairie, the National Air Tour was full of faith in clear skies and happy landings, after varied experiences such as had marked none of the six previous tours.

Just when it seemed that there was nothing new to say about this reliability tour which Edsel Ford instituted seven years ago, old General Law of Averages rose to rule out the old story of many entries and uniform good fortune, and compels the reluctant scribe to record that the 1931 tour had more bad luck and bad weather than all previous tours combined.

It got away from Detroit, July 4, with fourteen entries and accompanying planes. Before the group of racing planes had completed the swing east across Canada to Binghamton, N. Y., and south to the Tennessee border, much had happened, and four of the entries were out to stay. They were the Bird cabin plane, Leonard Flo, pilot; the Mercury Chic, Harvey Mummert, pilot; and both Buhl Bull Pups, Charley Sugg and Walter Henderson, pilots. Schneider had also had a hard landing in the Kentucky hills, reducing the contestants to nine until he caught up. And then came the Battle of New Orleans, with a near-hurricane holding Jack Story's Buhl Airsedan to the ground for a day or two, while George Dickson's Aeronca, which had held on so pluckily until then, was blown around and damaged. Story and Dickson were in the running later, and to go back to our opening sentence, as the flying tourists squared away for the race north from Fort Worth, there were ten of them left, and they seemed to have shaken off the jinx at last.

It may as well be said right here that the question as to why there were not more entries was frankly discussed around the tour by pilots and mechanics, technical men and newspaper men, and that the opinion was freely and frequently expressed that the formula will have to be altered if there are to be more tours, or three or four classes be opened to the contestants.

Taking the lead at the start, Harry Russell, 1930 winner, flew Ford No. 5 to a bigger score every day, with James H. Smart, in Ford 4, showing a little more speed. But the two Whirlwinds and center Cyclone totaled less horsepower than Smart's three Wasps, so the working out of the formula enabled Russell to pile up more points each day.

Close to these two big transports, in speed, was the tiny Gee Bee Sportster flown by Lowell Bayles. It could give the big fellows a real race. Powered with a Warner, it was eligible for the light plane trophy, and was right in the competition in spite of the advantage the formula gave to cabin ships.

And in parenthesis right here it should be said that the proponents of the formula point out that the tour was originally intended as a test of transport and cabin planes rather than one- or two-place sportsters, and rightly gives an edge to the cabin planes.

The light plane trophy also inspired Eddie Schneider, 19year-old former transcontinental junior record holder, to keep his Cessna in third place until his impromptu landing in Kentucky left him in last place, whereupon he caught up only to begin overhauling the others with some prospect of again winning and holding the trophy.

Bayles succeeded to third place and Jack Story with his old Buhl Airsedan, the Sun God, held down fourth to become a subject of debate at a pilots' meeting at Fort Worth because the Buhl entry had been waved back by Manager Collins, out of the thick weather out of New Orleans, and later was allowed, by the technical committee, full score for the succeeding laps.

(Continued on page 121)



View of Ford Airport, Dearborn, Michigan, showing planes ready to start on the 1931 National Air Tour

## EDITORIALS

#### OUR NEW CHIEF

RIGADIER GENERAL BENJAMIN D. FOULOIS has been appointed Chief of the Air Corps, fulfilling a hope expressed in the columns of Aero Digest in June. General Fechet who retires in December could have no more worthy successor to carry on the difficult tasks of this most important arm of national defense.

The fact that General Foulois achieved his high place in American military aviation through personal merit, rising slowly but surely from the humble ranks of the service, is at once an inspiration to others and a creditable indication of the fairness which is slowly but surely making for progress in aeronautical science.

General Foulois can be depended upon to continue to carry out the two-fisted policies which are second nature to him and traditional to his predecessor.

#### AIR MAIL'S 20th ANNIVERSARY

T is hard to believe that next month marks the 20th year since the first air mail was carried in the United States. How it has grown! In 1911 Postmaster General Frank H. Hitchcock officially started off Earle Ovington who carried a few sacks of mail in his flimsy Bleriot monoplane at Mineola. Five years ago the first of the contract air mail routes was opened by the Post Office Department, the beginning of a well planned network of air mail routes which now connect the principal cities of the country.

Gone is the low-powered, converted mail plane with which the original air lines carried on such a magnificent pioneering effort. In its place we have specially built and purposely designed air vehicles which have become synonymous with dependability, carrying more and more mail and express each year and providing a working basis on which our air passenger transport services are founded.

No wonder the airlines in foreign countries look to our air mail lines with something akin to envy and unmistakable signs of respect.

#### MORE POWER, MORE SPEED, MORE DEFENSE

VIVE our engine and aircraft manufacturers the I money and they will design powerplants as good as Europe's best, a matter of immense import to our national defense as well as to our national pride as record holders, as, for instance, in the matter of the Schneider Trophy contests. Congress, therefore, should change the Aircraft Procurement Law of July 1, 1926, so as to enable our air services to order planes from manufacturers whose designers show capability of developing plans embodying new and valuable ideas (the Government retaining its auditing privilege) not to the limit of \$75,000 only, as at present, but up to \$500,000. It has been the handicap of the \$75,000 limit which has been principally

responsible for America's inability to compete with other countries in engine power and speed, in these days matters of an import so vital that it cannot be exaggerated. It is predicted that 375 miles per hour will be the minimum required to win the next Schneider Trophy race and in view of this England and Italy will have engines of over 2,000 horsepower. We could have the same.

If our manufacturers are given money to spend in such developments, they will beat the world. To expect them

otherwise to do it must be, of course, absurd.

So here is a real opportunity for Congress to do something constructive for America's defense at a cost low by comparison with charges which habitually pass unnoticed in connection with those vast contracts now at intervals turned over to the builders of the lumbering steel warships which every progressive mind well knows must become hulks as soon as enemy aircraft begin to rain bombs on or even near them.

#### NOTABLE FLIGHTS

THE press of the world heralded the exploits of many ambitious fliers who made successful flights across the ocean last month. Some of these flights were accomplished with astonishing precision and most of them achieved their objects with little difficulty. Various types of planes, pilots and navigators of different national origins, coming from widely separated parts of the United States, participated in these flights; their flights were directed to different countries, and in the case of Post and Gatty, several foreign lands were traversed.

The high percentage of successful flights of this character is an unmistakable sign of advancement in the arts of avigation, instrument and engine building, aircraft construction and of flying equipment generally. Moreover, such flights have a good-will value worth considering and their trail-blazing is destined to assist in the establishment of future international air routes.

#### UNITED UNITES

HE concentration of activities of Boeing Air Transport, National Air Transport and Varney Air Lines, operating five strategic air mail, express and passenger routes, into one company, United Air Lines, Inc., is of momentous importance.

These lines, all pioneers on their respective routes, are all subsidiaries of United Aircraft and Transport Corporation, which has now welded the transport companies into one compact unit, which will mean added efficiency and economies and make United Air Lines not only the largest air transport group in the United States, in point of daily schedule mileage flown, but in the world.

The figures of United Air Lines activities are impressive. It now has 120 airplanes, which are flown 35,000 miles a day, or approximately 12,000,000 miles a year, over a 6,360 mile network of improved, lighted airways. United Air Lines gives direct service to thirty-eight cities in seventeen states.

Impressive as these figures are, the full significance of the forming of this compact unit is best visualized by looking at the airway map of the nation. United has a 2,760 mile air span, linking New York to San Francisco.

## ANOTHER VANISHING AMERICAN

?

S I wander with all the philosophical dignity befitting one of my advanced age amid the peaceful environs of "Porous Gables," my estate at Fogville-on-Mud, there are wafted to me on the summer breeze sundry dull rumblings of discontent among the lads who fly. All, it seems, is not quiet on the Potomac, or even on the Mississippi. The lads, I hear, laying my oyster-shell-like ear to the ground of persistent rumor, are somewhat unhappy. They are getting into the airliners with pained, hurt looks on their faces, denoting

that the financial operation but recently performed upon them by the operators was not an unqualified success from

their point of view.

By the time these remarks upon the subject have passed through the printing and distribution process—and are hanging out back where those who tarry may read—the dull rumblings may have taken on a sharper and more angry note; and the lads who at this writing are pushing the mail and passenger planes across the continent may be resting at their country or seaside residences, watching the busy bee improve the shining hour.

Then again, they may not. This prevailing coolness between operator and pilot may be settled amicably, and the lads again may be urging their craft into the air with all their accustomed vigor and vivacity. I certainly hope so. Everything considered, this would be an unfortunate time for pilots and operators to disagree too violently on any policy. Air mail and passenger business is still in a stage too formative to render any squabbling between operators and pilots other than a misfortune for the good of the business as a whole. Better far for both parties to compromise, give in a little here and there, and pull together. A wagon makes but slight forward progress when one horse pulls to the right and the other to the left; and the annoyed driver may belabor both horses impartially. In this instance the driver is the Public who supplies the

Whichever may be the outcome, it seems to me high time to take a good look at the pilot in an endeavor to find out just where he is heading in this commercial scheme of aviation. Is he forging ahead as a professional man making reasonable progress in his chosen profession? Or is he sliding backward like a workman over whom the employer holds the power? Or, again, is he merely traveling sideways, after the accustomed manner of a crab?

For that matter, has he a profession—or merely a trade? Is he the experienced captain of the airliner or merely the driver of a bus that left the ground? Is he a professional



From an Oil Painting by William Heasily

by baldwell

man whose judgment should be consulted, or is he a workman who should do what he is told? What is a pilot, anyhow? Can we classify him?—divide him up into classes according to the work he is doing, according to the experience he has had?

These questions, I believe and long have believed, shout for answers. Unless we supply answers satisfactory alike to pilots and to operators, the pilots and operators will be in the position of getting no place, and getting there fast. Work, whether in an airplane, in a direc-

tor's office, in a factory, in a bank, or at a typewriter is best done when happily done. At the present writing the situation is far from happy, to say the least. It should be made so as speedily a possible.

What follows are my own presently held thoughts on the matter, subject to further thought and further information, subject, very probably, to much revision. In the course of a long and often ill-directed life I have had occasion to change my opinions and beliefs several times—for to my sorrow I have found that my judgment is not infallible—so whenever I say anything now I invariably mention that in a world that changes as rapidly as ours, what is advisable and right to-day may be inadvisable and wrong to-morrow. In presenting my opinions I possibly may tread on some tender toes. That I regret, of course. Nevertheless I purpose to tramp stolidly along what seems to me a straight path, and if anyone has his feet in the way I'm going right over them. If they trip me up, that's my bad luck; if I wander over their pet corns, that's theirs.

Is a pilot a man with a highly specialized profession, or is he a workman with a trade? Well, in my opinion, it

depends entirely upon the individual pilot.

For instance, standing on Cleveland's Municipal Airport—by special permission of the copyright owner, Signor Jack Berry—I watch such a master of flying as Bill Williams take off into the night with a load of mail for New York. It is, we will suppose, an especially dark and dirty night, with snow and sleet in the air at times. It is one of those nights when even the night flying birds have cancelled, for of course you know that birds do not fly in all weathers—it took man to become that ambitious.

And there is Bill Williams, in the opinion of many people, including myself, one of the greatest mail pilots in the world. The problem that faces him to-night is a comparatively simple one, according to an operations manager with whom I discussed this suppositional case. All he has to do is to study the weather reports and come to the cor-

(Continued on page 110)

### PLOTTING WING CHARACTERISTICS

HE theory of wings and wing sections does not permit the prediction of all aerodynamic characteristics of wing sections. It is by far too incomplete for that end.

Theory furnishes only a part of the existing relations; for the remaining properties, we have to rely on experience and on laboratory tests specially made for each new wing section. Theory is not without value, however, since it makes possible a reduction of the number of tests necessary for exploring the properties of the

sults of the remaining tests. These measurements are made by exposing models of the wing section in question to the artificial air flow of a wind tunnel at one full series of different angles of attack, weighing all air forces at each angle. The tests are generally made at one speed and at one aspect ratio only,

wing section, and a more perfect interpretation of the re-

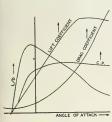


Figure 1. Lift curve diagram

another speed, scale, and aspect ratio, we depend on theory. In order to facilitate the conversion, it is customary to reduce the measured forces to coefficients, and to present the results to the public by plotting these coefficients and the angle of attack in certain combinations.

and for the determination of the air forces at

These wind tunnel tests are made primarily for the investigation of

the wing sections only, but they contain both the effects of the wing section chosen and of the aspect ratio employed. The presented data constitute a mixture of relations characteristic for all wings having the same wing section, and characteristic for all wings having the same aspect ratio. That is somewhat confusing, particularly if tests with different wing sections and with different aspect ratio are to be compared with each other. The larger the aspect ratio,

the better results (with the same wing section) are indicated by the outcome of the test. Results of model tests with different wing sections cannot therefore be directly compared with each other if the aspect ratio of the two wings are different, unless corrections are made for the difference in the aspect ratio. A uniform aspect ratio of such models is therefore desirable, and usually preferred. Many models of wings have been given the aspect ratio of six. The aspect ratio five is less frequent, but still often used. These are the only two aspect ratios that might properly be called standard. Only a small number of wing section tests are Figure 3. Induced drag co-efficient

Article Fourteen on the Principles of Aerodynamics

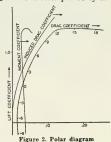
#### Dr. Max M. Munk

five or six; in such cases they are odd and the values derived therefrom are difficult of comparison.

Aeronautical engineers should learn how to compare the results of wing model tests made with different aspect

ratios. The process is not at all difficult. Allowance is made for the different influence of the aspect ratio in keeping with the pure theory. The two main equations of theory are used directly for converting the air forces of a wing section exhibited at one aspect ratio to the air forces corresponding to another aspect ratio. This computation is performed by starting with the lift coefficient, CL. For one particular lift coefficient CL the angle of attack a and the drag coefficient CD1 belonging to one aspect ratio a1 may be known from the experiment. It is required to compute the same two quantities, now called a and CD2 for a second aspect ratio a2. This is accomplished by assuming the angle of at-

tack and the drag coefficient to consist of two portions-the effective angle of attack and the profile drag coefficient (associated with the wing section only and independent of the aspect ratio) and the induced angle of attack and the induced drag coefficient (associated with the aspect ratio only, and independent of the wing section). The induced quantities are



computed for both aspect ratios; those belonging to the original aspect ratio are subtracted from the test results, and those belonging to the desired aspect ratio are added in their place. This computation is expressed by means of the two formulas:

Induced angle of attack,  $\alpha_1 = C_L/\pi\alpha$ Induced drag coefficient,  $\hat{C}_{D1} = \hat{C}_{L^2}/\pi a$ 

Hence the final conversion formulas become:  $\begin{array}{l} \alpha_2 = \alpha_1 - (C_L/\pi a_1) + (C_L/\pi a_2) \\ C_{D_2} = C_{D_1} - (C_L^2/\pi a_1) + (C_L^2/\pi a_2) \end{array}$ 

The same conversion is necessary for the computation of the characteristics of an airplane wing from the characteristics of a wind tunnel model, if the aspect ratio of both is not the same. As a matter of fact, it seldom is, and consequently the results of wing section tests are seldom used directly, but in most cases must be converted in the prescribed manner before being used. Let us now see how far the ordinary method of presenting the model tests to the public takes consideration of this necessity.



made with aspect ratios differing from inserted into lift curve diagram

It does so very imperfectly. (Continued on page 54)

## SAFETY FOR THE LIGHT AIRPLANE

#### **Dwight Huntington**

N previous articles (February and March issues) the light plane was viewed from the standpoints of utility and economy. Here let us round out the survey with a study of the numerous safety problems confronting the designer.

Making the light plane safe is largely a matter of profiting by knowledge already bought with costly experience. It is regrettable that one of the several important

aeronautical agencies did not long ago undertake the task of analyzing all aircraft accidents, thereafter presenting the findings to design departments and engineering schools. That such a course would greatly have benefited the industry is certain. How soon it will be undertaken is, of course, problematical; legal difficulties appear to stand in the way.

Thoughtful designers usually learn a lesson or two from every accident on which they obtain accurate information. Even accidents due entirely to foolhardy piloting may be studied with profit for their after-crash effects. But the extent of a designer's knowledge on the subject of safety is, as it should be, more a matter of his practical experience with crashes than of his general education. We need but to glance at occasional experimental ships to realize that their designers have failed to profit by mistakes which caused crashes or increased their seriousness

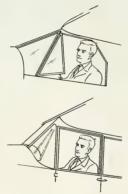


Figure 2. Opened side windows

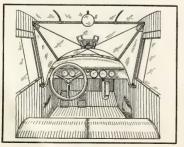


Figure 3. Several meritorious cabin design features

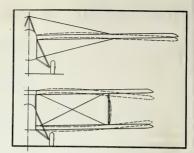


Figure 1. Improper rigging may cause excessive loads

as much as two decades and more ago.

Although I firmly believe that, once the requirements of the Department of Commerce have been met, economy is the real basis of light plane competition, a thorough study of the safety problem involved can give great impetus to the enlargement of this branch

of the industry.

Furthermore, manufacturers may benefit themselves, the purchasers and the industry in general by sticking to the facts regarding their products. Exaggerated sales data on the relative safety of private flying, and particularly on the accomplishments of certain ships, probably have been primarily responsible for many more accidents than have errors in design. Talk which results in making the inexperienced pilot over confident in his ability in an art which usually levies heavy taxes on errors in judgment are serious deterrents to the industry. In the final analysis the minimization of flying

hazards is entirely up to designers, assisted by test pilots, and publicity men should stick to the facts and figures obtained from these sources.

The most important truth, however unpleasant, which everyone connected with aircraft manufacture and marketing should keep uppermost in mind, is that the industry, through carelessness and exaggeration, has been directly responsible for a large number of serious accidents in the past; and that through negligence it can be responsible for a much larger number in the future. Reinforcing the ethical responsibility, there is the cold business truth that no plane owner will journey back from Valhalla to trade in his last year's model.

Obviously, the largest number of pleasure flying accidents are due to the personal factor-foolhardy pilotage. In this class, for example, belong all accidents due to adverse weather conditions, charged against the pilot as errors of judgment. Yet between the group of accidents caused respectively by shortcomings in ships and in pilots, there is a large field of divided responsibility or, more specifically, AUGUST, 1931



Figure 4. Struts often cause injury in "freak" accidents

dodged responsibility. Here we often find that some poor feature in a design has so cramped a pilot's style that an accident followed upon what should have been permissible piloting. Inadequate visibility, for example, has been a factor in many serious plane accidents. Plane and pilot factors are so closely interwoven that it will pay the industry to take a long view of matters and assume entire responsibility for all accidents except those clearly due to foolhardy flying. Safety problems are essentially design problems and, in the final analysis, must be solved on the drawing board.

For convenience and clarity we may group all safety considerations under the following six headings: aerodynamics; structure; visibility; pilot; crash, and fire. Adequate visibility, having already been commented upon (June issue), will be omitted here.

Making a first assumption that the plane under consideration carries an A.T.C. and is, therefore, reasonably sound aerodynamically and structurally, we may proceed to examine it for possible improvements.

A low stalling speed, with good control and no tendency to spin, probably is the most desirable feature, and this speed, in my opinion, certainly should not exceed 35 miles per hour. Cruising and maximum speeds are relatively unimportant in pleasure flying until reasonable safety at stall is assured. Thereafter speed range will become the point of competition. In this connection one discerns the direction of rivalry between plane and autogiro designers for the pleasure craft market—the former striving for an increase in safety, the latter toward a reduction in cost of their apparatus.

The matter of low speed cannot be solved by a light wing loading alone, since the result may be a floater, having a flat gliding angle but requiring a large landing area. Therefore, light planes must be capable of being mushed into small fields without any tendency to fall off, for, as their aerodynamic efficiency increases, the difficulties attendant

upon getting them into small spaces other than by mushing likewise increase. From the viewpoint of forced landings, the ability to get into a small field is more important than a large gliding radius.

Another aspect of the slow landing speed problem is the matter of discomfort in bumpy weather and danger of air

Another aspect of the slow landing speed problem is the matter of discomfort in bumpy weather and danger of air sickness. A plane with a light wing loading and a high maximum lift coefficient invariably pitches and rolls badly on windy days, as many who have handled old "Standards" will recall. Contrariwise, a ship with a heavy wing loading and a relatively low lift coefficient plows right through gusty weather in creditable style. These two types may perhaps be best compared to a canoe and a barge on rough water, one dancing, the other plowing along.

Right here the advocates of variable lift wings and shock absorbing devices for wings come into the picture. There is much room for development along these lines and bringing these problems to the fore will be one of the many meritorius features of light plane development.

Power reserve sufficient to provide a good angle of climb is important, for although a plane does not have to be flown out of a very small field, many owners will try it. Consequently, safety and stability will be increased by more attention to this particular.

The plane's ceiling, too, should receive further consideration for, as prospective purchasers become more thoughtful and inquisitive, it will be found advisable to design for a ceiling sufficiently great to permit the plane to go almost anywhere in the Americas. The ship that may, under very favorable conditions, be coaxed over the Great "Jenny" Divide, will soon fade completely out of the picture.

An increase in the structural safety of the ship will result from all-metal construction, although cloth covering may survive for many years; fewer and larger members, fittings and pins, to prevent excessive deterioration as well as to reduce the chances of fatigue;

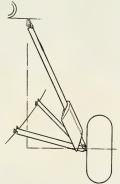


Figure 5. Undercarriage design

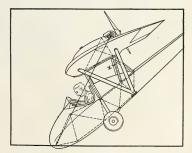


Figure 6. Pusher type striking ground at steep angle

positive action controls with a minimum number of moving parts; a stabilizer rapidly adjustable from the cockpit to augment the elevator control which will fail on occasion with otherwise serious results; an undercarriage of splitaxle type with wide tread and large shock absorber travel, equipped with wheels and tires of sufficient size for use in the rough and soft surfaces of undeveloped fields; and means to prevent frequent nosing over. Steerability, by brakes or otherwise, to enable the ship to be taxied in a wind, without outside assistance, is a worth while utility consideration.

Powerplant reliability implies air-cooling, integral lubricating system, a decrease in the number of vital parts and simple, reliable plumbing.

The next and probably the most important safety consideration is the designer's treatment of the pilot, or, in other words, his appreciation of the human factor, which here includes all occupants of the ship. This factor admittedly is far too large. It is the designer's duty to reduce it to sensible proportions—to shift the greater burden incident to pleasure flying from the pilot to the plane.

A manufacturer who places in the hands of pleasure seekers a ship thoroughly sound aerodynamically and structurally, yet which, by some small oversight or careless act, may bring ruin to itself and its occupants, certainly is not building for the future. What is required is a plane that will virtually fly itself with an ease comparable to a wellbuilt flying model airplane—a type wherein, should the pilot become rattled, he need but fold his hands and permit the ship promptly to straighten itself out.

In designing low-priced pleasure planes then, it is well to assume as a working basis that we are catering to an inexperienced, careless and even foolhardy clientele.

Let us study the influence of the human factor from two angles—maintenance and operation. The first obligation is to provide a structure having its vital parts—and a plane has plenty of them—capable of easy inspection prior to a lop. This inspection is an important safety measure and in the best interests of the industry must be encouraged. Yet between the choice of spending, say, thirty minutes inspecting his ship for perhaps a fifteen-minute jaunt, and no inspection whatever, many an impatient owner is apt to rely on his rabbit's foot and omit the annoying delay. To some, however, the uncertainty is apt to be distracting. In either case, the pleasure of ownership is reduced and sales resistance increased.

The best means of overcoming this difficulty lies in providing an inspection chart for the owner's use. Two advantages will accrue: the owner will have a thorough routine mapped out for him; designers will promptly take steps toward simplifying their charts and decreasing the time required for inspecting the essential parts.

The use of well-oversize hinge pins in controls, wings, empennage and undercarriage; omission of "tin" fittings; and care in the suspension of cranks and pulleys is important. A good example in simplification may be found in control linkages: a cable hook-up requires four pins and occasional readjustment for stretch; a push rod, two pins and no adjustment. Fragile columns that may be slightly bent in careless handling must be avoided. Powerplant in spection may be fostered by means of simplified cowling, easily opened.

The rigging of wire-braced structures by unskilled hands is an important consideration. Initial loads are imperative,

yet these may be stepped up to a ruinous extent in realignment by an inexpert rigger. Figure 1 illustrates the point, exaggerated for clarity. One way out lies in marking the wire threads, by paint or otherwise, as a guide to the owner. The ideal structure from the maintenance viewpoint undoubtedly is the one rigidly braced, with fixed-end struts. No private plane owner should be permitted to tamper with the incidence or dihedral of his wings, with the possibility of imposing dangerous loads in the structure.

Operating hazards are numerous. Safety in cranking the engine alone until starters become economically available; decrease in nervous strain through increased accessibility of cockpits and cabins; greater comfort in seating arrangements; weather protection; decrease of noise, principally by means of silenced exhausts and slower speed propellers—these are typical problems whose solution would do much to add to the safety and pleasure of flying.

Much can be done in simplifying controls. Balanced surfaces; cam-action linkages; automatic synchronization of ailerons and rudder; and removal from the cockpit of all unnecessary control members capable of being jammed by clothing or otherwise, are old problems still requiring satisfactory solution.

The addition of a suitable stallwarner to prevent accidents due to climbing stalls and "graveyard" glides; provision of a sight fuel gauge and reserve compartment tank; and the grouping of engine and flight instruments, are likewise important.

A certain amount of pleasure flying will terminate in rainstorms and visibility must therefore be considered. Due to the amount of water encountered, a suitable windshield wiper is a serious problem. The best solution at present lies in enabling the pilot to peer out of an opened side window and so arranging the windshield in front as to deflect the water away from his face. Figure 2 illustrates this idea, the provision of windshield "wings" being taken from the Bellanca.

Having examined the principal causes of crashes, let us consider the after effects—the crash hazards. The only ships which we are sure will not crash are those in museums, this statement being qualified further to except the ones which may have to be reconditioned in time of war.

Assuming then that our planes will crash, we must concern ourselves with mitigating the consequences as much as possible. We need not take into account crashes in which ships strike with sufficient force to kill their occupants outright, excepting, of course, crashes involving fire risks which may affect other people.

Persons figuring in a crash may suffer from one or all of the following effects: being thrown against a dangerously protruding part of the ship; pinned in by a structural
member which has buckled; pinned down by the ship in
nosing over; attacked by a misplaced and weakly coupled
strut; struck by a weighty object dislodged by the impact;
and burned.

In the first instance we may assume the presence of the usual safety belt and thereafter look about for objects which occupy dangerously exposed positions. Figure 3 illustrates several meritorius design features. Instruments should be face-flush with the board whenever possible and a well-padded crash wall provided, extending all the way across the upper part of the board. Individual crash pads,

(Continued on page 119)

## **AIRCRAFT** FINISHES

By W. W. McCutcheon Research Dept., Stearman Aircraft Co.



Stearmans fresh from the finishing

T one time during the development of aircraft the finish held little if any importance in the buying or selling of an airplane. At this stage of the business the situation has changed considerably and the finish plays as important a part in the sales work of an aircraft firm as with an automobile concern. Little is known by the lavman of the early history of aircraft finishes of the fabric type; therefore the author of this article will attempt to give some of the highlights of aircraft finishes in the past.

The earlier types of gliders and airplanes were covered with cloth without any coating whatsoever. A little later the cloth was impregnated with glue sizing and starch. These were highly affected by moisture, producing loose surfaces, which made the flying of such craft practically impossible. The discovery of a preparation known as collodion seemed to answer the purpose but this material was quite expensive. After many years of research a product was developed which is now called dope. Fundamentally the same as collodion, the solvent was much less expensive and consequently the mixture could be supplied at prices which was considered reasonable in those days but which now would be considered expensive.

This material served well but something was needed to protect the dope film from the elements. Varnish was used

but the product of that time was not up to present standards and was found to chalk and disappear. Then came the demand for color. Up to this time about the only color for airplanes was aluminum, which was made from aluminum powder mixed with dope. This powder is still employed considerably where light shades are used which are not opaque and which allow the actinic rays of the sun to pass through the color coat and destroy the clear dope. It is also used in color combinations as a final finish.

When the demand came for

more highly polished surfaces, metal lacquers were employed. This finish did not prove satisfactory due to the composition of metal lacquers, which are made up of cellulose nitrate dissolved in suitable solvents together with gums or resins which are incorporated to give adhesion to the base and also the hardness of film necessary for a glossy finish. The fabric was found to flex too much for such a coating, and cracking of the finish

was in evidence shortly after the airplane left the factory. More plasticizers or softeners were added to prevent this cracking but these left the fabric "flabby," a condition not to be desired with fabric construction.

Airplane manufacturers then set about to cooperate with done manufacturers in an educational campaign to sell the pigmented dope idea to prospective buyers. Pigmented dope is, as the name implies, a clear dope with pigment of desired incorporated therein. With the new and improved methods of finishing, excellent finishes can be obtained through the use of this type of material.

The actual process of painting and doping airplanes is an interesting sight. The Stearman plant, located at Wichita, Kansas, affords an example of finishing work carefully done. No detail is overlooked there. Air conditions are checked to determine the percentage of moisture in the dope room. Cleanliness is one of the primary considerations. The routine that is followed at the Stearman plant is as follows: The skeleton assemblies are covered with cotton cloth and then sent to the paint shop. Here all traces of dust or dirt on the fabric are removed, as well as any oil or other foreign matter, all of which has to be eliminated before the finishers can start their work. Then two coats of clear nitrate dope (cellulose nitrate)

are applied by brushing. The men employed as brushers must use extreme care in applying these coats since the final finish depends upon the foundation coats. The tapes covering the seams and ribs are applied at this time. Each coat is allowed to dry thoroughly before the next coat is applied. This drying period varies with the dope and temperature conditions but usually is about forty-five minutes. For the next two coats of clear dope, the spray tank is used. This method saves much time and the resultant job is much superior to a brushed finish, due to the evenness with which the spray equip-



View of finishing department of Stearman plant

ment applies the dope. Some sanding is done on the fourth coat to eliminate the nibs on the surface of the clear dope. The last operation is the application of two coats of pigmented dope of the desired shade. If an exceptionally highly polished job is required more sanding must be done and more coats added. Heavy coats are not advisable as (Continued on page 128)

## GERMAN TRANSPORT AIRPLANES

RELATIVELY young German aircraft manufacturing enterprise is the Bayerische Flugzeug-Werke Company (generally called BFW for short) of Augsburg, in Germany. The success of this company may be said to date from 1927, when it engaged as chief engineer Messerschmidt, who had considerable experience in the construction and flying of sailplanes and the lighter type of motored planes. He was one of the first (if not actually the first) to apply his sailplane experience in the design of motored planes and to succeed in the construction of an unusually economical type of motor transport plane. The good flying qualities of BFW machines are generally recognized and various models are being built under license in other countries, including the United States. This maker produces both sport and transport planes, the former being constructed entirely of wood, the latter of duralumin and steel.

Of BFW transport planes, four models are now in regular production. The latest is a small three-seater with a 110horsepower motor, called the M 26. The oldest type, M 18, of which the first one produced by Messerschmidt five years ago when he was still manufacturing independently, is still in regular service and the most recent overhaul revealed its excellent condition, showing it fit for several more years of service. The M 18 d is the present model of this type. It is able to convey between five and seven persons and has a 200-horsepower motor. The M 24 b, the third model, with a 400horsepower motor, accommodates 10 persons and the last, N 20 b with 600 horse(Part II)
The BFW Planes
Edwin P. A. Heinze

power, 12 persons. All models are similar in general design and have the cantilever type of wing flanged on top of the fuselage with the cockpit beneath the leading edge.

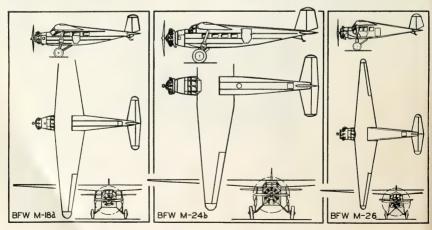
The wings (which have a straight upper edge and a lower edge which tapers up from the center to the tips, thus affording a slight dihedral angle) are built up around a single I spar of open, highsection duralumin channels. Ribs of sheet duralumin are attached to this spar on both sides. The structure is then covered with smooth duralumin sheet and a rigid double box divided longitudinally by the spar is thus obtained. The trailing edge is formed by the attachment of correspondingly shaped duralumin frames covered with fabric. The whole wing structure is so simple in design that even major repairs can be effected practically anywhere with ordinary tools and ordinary unheat-treated sheet duralumin may be employed. The ailerons are also fab-ric covered. The aspect ratio of the wings is as high as one to 10 and the plan contours are trapezoidal, the tips being formed by detachable semi-circular caps. These latter are one of the characteristic features of BFW planes, the makers claiming that they keep tip eddies away from the ailerons and thus greatly facilitate control so that no compensation or balancing of the control surfaces is required. The same principle is used for the elevator and the rudder,

The fuselage is of rectangular section with rounded corners. The top is straight while the bottom line is curved. The form is aerodynamically efficient as wind tunnel tests have demonstrated. The framework consists of open duralumin channels covered with smooth duralumin sheets and reinforced on the outside by superimposed stiffening channels running the length of the fuselage, in allel to one another.

A feature of all BFW machines is the spaciousness of the interior, which is not obstructed by any struts and stays projecting out from the walls or ceiling.

Control surfaces are also of the cantilever type constructed in the manner of the main wing. Ailerons, rudder and elevator are supported in ball bearings and all are covered with fabric. Rudder and fin are mounted on top of the tail and do not interfere with the one-piece elevator. Connecting rods and cables for the operation of the empennage pass through the fuselage in a straight line and are at no point exposed to the wind or weather. Aileron control rods and cables lie inside the wing, self-aligning ball bearings being employed in connection with the pulleys. Access to the controls of the tail surfaces is obtained through an aperture on top of the fuselage near the tail end.

The landing gear is of the W type with split axle, the perpendicular members (attached to the spar of the wing) incorporating the shock absorbers, while



AUGUST, 1931





BFW M-26

BFW M-24

the other members are linked to the lower fuselage edges. Heretofore, the planes have been provided with tail skids and no brakes, but the newer machines are now also being supplied with tail wheels, wheel brakes and (if desired) with hydraulic instead of rubber cord shock absorbers.

All these machines are of the singlemotor type and the smaller ones are generally equipped with air-cooled radial motors. The largest is preferably equipped with a water-cooled motor; for the second largest, both types are optional. Since each model may be fitted with various different motors according to the desire of operators, interchangeable motor cradles are provided so that one type of motor may be easily replaced by another. The cradles are attached at four points and the connections for the controls are also standardized so that no constructional alterations become necessary when fitting another type of motor. The fuel tanks are located on both sides of the fuselage inside the wing, which, lying astride the fuselage, is cut out in the center to the spar to make room for the cabin top. The oil tanks lie behind the fire wall inside the cockpit, which is wholly enclosed.

#### The BFW M 26

The M 26 has no separate cabin for

the pilot, who sits in a centrally arranged seat, while the two passengers sit sideby-side behind him. To the rear of the cabin is a luggage compartment, to which access is obtained through a separate door. This machine has a span of 40.68 feet, a length of 23.46 feet and a height of eight feet. The effective wing surface has 154 square feet area. One of the three following motors is fitted: the Siemens & Halske SH 14 air-cooled radial motor of 100 to 110 horsepower, the Argus with four inverted cylinders in line developing 80 to 100 horsepower and the five-cylinder radial Wright of 150 to 175 horsepower. With the first mentioned motor the machine weighs empty (including 50-pound tool kit) 1,060 pounds. Allowing for pilot and fuel weighing approximately 460 pounds, there remains a payload capacity of 440 pounds-that is, the total load capacity is 900 pounds and the full-load flying weight 1.960 pounds. The maximum speed is given as 106 miles per hour, the cruising speed at 15 per cent throttle (on the number of revolutions equal to about 40 per cent power throttle) 88 miles per hour, and landing speed at full load 53 miles per hour. The plane is able to climb at the rate of 6.8 feet per second near the ground. The wing loading is 12.73 pounds per square foot and the power loading 17.8 pounds per horsepower. At cruising speed the

machine is able to remain in the air for six hours and to cover a distance of approximately 530 miles.

#### The BFW M 18 d

The BFW M 18 d has a span of 51.8 feet, a length of 29.5 feet and a height of 8.8 feet. The wing surface is 269.4 square feet. The wing is 18 inches thick in the center and tapers down to 2.36 inches at the tips. The lower surface is concave. The spar is located in the thickest part of the wing and is built up of one upper and one lower right angular channel, the two being connected by smooth struts riveted in place and reinforced by riveted-on stiffeners. The nose ribs consist of sheet metal similar to those to the rear of the spar. The rear ribs extend two-thirds of the chord. Not only the leading edge and both surfaces are covered with duralumin sheet, but also the open end at the rear forming an auxiliary spar, to which is attached the aileron and trailing edge boxes as previously described. The structure of the latter is of the triangular-truss type.

A separate cabin is provided for the pilot and mechanic. The latter place may be taken by a passenger, inasmuch as controls are normally installed only for the pilot. In the passenger cabin the two front seats face rearwards, that is, their backs are toward the cockpit wall. Between them is a narrow door giving access to the cockpit. The other four seats are arranged in normal fashion. Behind the cabin is a luggage or freight hold with searate doors.

Various motors may be furnished; the Siddeley Lynx of 215 to 225 horsepower (with or without supercharger), the seven-cylinder Wright (225 to 240 horsepower) or the nine-cylinder Wright (300 to 325 horsepower). With the latter, the plane attains a speed of 130 miles per hour and a cruising speed of 110 miles per hour, whereas with the others the maximum speed lies between 112 and 118 miles per hour with a cruising speed around 100 miles per hour. The flying weight of the machine with the ninecylinder Wright is 3880 pounds, its emnty weight being 1,880 pounds, leaving 2.000 pounds for the load. Of this load, 465 pounds are for fuel and oil, which suffices for a flight of almost four hours, or approximately 415 miles. The landing speed with full load is 56 miles per hour.



The BFW M-18d as a landplane and seaplane

(Continued on following page)

(Continued from preceding page)

These figures are relatively unfavorable as the nine-cylinder Wright is somewhat heavy for this machine, which works most economically with the supercharged Siddeley Lynx. With the latter it has a cruising range of 6.1 hours, or 590 miles at 15 per cent throttle. The wing load at full flying weight is 13.5 pounds per square foot. The two tanks of this machine hold 63.5 gallons. They are made of sheet Elektron, which has proved efficient for the purpose and is 40 per cent lighter than aluminum. The tanks can be removed easily through openings in the lower surface of the wing, in which additional tanks can be located if desired.

#### The BFW M 24 b

Next in the BFW series of models is the M 24 b, which has seating accommodation for eight passengers besides pilot and mechanic. This model has a length of 42 feet, a span of 67.58 feet, and a height of 10.5 feet. The thickest portion of the wing measures 23.6 inches and tapers toward the ends down to 4,48 inches. The main entrance is on the left side to the rear of the cabin into the lavatory compartment. The door between the latter and the cabin covers the lavatory part when open, so it is not seen when entering or leaving the plane. A second door, for emergency exits, is provided in the right wall of the cabin and an additional means of exit is given by a manhole in the ceiling. A large luggage room is situated behind the lavatory

This model is provided with either a six-cylinder BMW 5, a motor of 320- to 350-horsepower output and water cooling, or with a radial nine-cylinder Pratt and Whitney Hornet motor delivering 450 to 525 horsepower and built under license by the BMW engine makers. A novel arrangement in this model is that the oil valve is connected with the ignition lever in such a manner that the latter cannot be brought into operation position before the former has been opened.

The wing area of this plane is 463 square feet. The full flying weight is 6,330 pounds, of which 3,580 pounds are net empty weight, leaving 2,750 pounds loading capacity. Of the latter, 1,160 pounds are normally taken up by the

The BFW M-20b. largest of the BFW transports, accommodates ten passengers in addition to the pilot and mechanic; it is powered either with a 600-horsepower BMW water-cooled radial engine or the 600-horsepower Siemens & Halske air-cooled radial, as shown in the adjoining three-view outline drawings.

crew and fuel so the payload amounts to 1,590 pounds. The wing loading is thus ap-13.7 proximately pounds per square foot and the power loading, when em-ploying the Hornet, slightly more than 12 pounds per horsepower. With this motor the plane has a maximum speed of: 108 miles per hour and,

with full load, a landing speed of 54 miles per hour. Near the ground it is capable of climbing at the rate of 14.7 feet per second. With normal fuel supply the machine can remain in the air for four hours and travel about 430 miles.

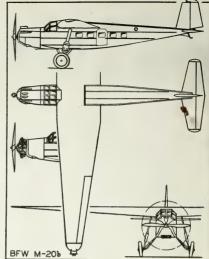
Mechanism of the rudder and elevator consists of rods and levers extending inside down the left side of the fuselage in a channel. To the rear of the cabin straight cables are employed for the rudder, whereas the elevator is actuated by

a rod so located as to be out of the way of the skid should the latter break. The BFW M 20 b

The largest of the BFW machines is the M 20 b, which provides room for 10 passengers besides pilot and mechanic. As in the previously mentioned model, dual controls are fitted in the cockpit, whereas in the smaller models these are optional. In its interior arrangement this plane differs from the former in having a luggage compartment, 3.6 feet in length, interposed between the cockpit and the cabin, to the rear of which a lavatory is provided that in turn abuts against a second luggage hold in the tail of the fuselage.

The interior of the wing can be reached through four covered manholes in the lower surfaces. In addition, the tanks can be removed so that through these apertures the interior of the wing becomes accessible even for repairs of considerable magnitude. The aileron control mechanism can be reached through covered holes in the lower wing surface. As in the other BFW machines, the wing is secured on the fuselage by means of steel flanges and bolts, the wing fit-

(Continued on page 56)





The BFW M-20, showing installation of the 640 h.p. BMW water-cooled engine

## **HOW ABOUT THE**

# PRICE of Airwheel Safety?

If you think that you can't afford the extra safety that Airwheels give to your ship and pilot—here's a surprise for you.

For several months now the cost of Goodyear Airwheels and the new Airwheel roller bearing brake has been about the same that you'd pay for ordi-

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When you buy a new ship specify Goodyear Airwheels



EVERYTHING IN RUBBER FOR THE AIRPLANE

#### PLOTTING WING CHARACTERISTICS

(Continued from page 45)

light of the preceding explanations it seems desirable that all diagrams describing the aerodynamic wing section characteristics should be reduced to one standard aspect ratio. Such is not the case, however. They should at least be prepared for that reduction as far as can be done conveniently, but this, also, is true only of diagrams of the less common kind. There should be only a single type of diagrams in general use, but there are two. The diagrams should principally indicate the properties newly and specially revealed in each test and unknown before, which are the properties of the section as such—not the ones fairly well anticipated, and chiefly depending on the aspect ratio. The more common of the two diagrams ordinarily found fails to comply with this requirement.

This is the diagram which came into existence with the minimum of mental work, as the rough output of laboratory procedure. The several characteristics are plotted against the angle of attack, because this angle of attack is varied first in the laboratory, and the other characteristics measured afterwards. The angle is plotted horizontally to the right, and all other quantities are plotted vertically against it. The diagram accordingly contains several curves-one for each quantity plotted against the angle of attack. There is first the lift curve, the lift coefficient against the angle of attack. This is an almost straight curve in its lower portion, curving down, however, when approaching the maximum value. The slope of the straight portion is fairly accurately predicted by theory, and the curve is therefore not very instructive as far as that slope goes. The lift curve is instructive in so far as it shows the deviation from the theoretical straight line, both at small angles of attack, if the wing flow burbles there, and particularly at large angles.

This diagram contains as a second curve the drag coefficient, plotted in the same way but on a larger scale than the lift coefficient. It would be of great practical use to also have the curve of the induced drag coefficient inserted, because this would show directly the profile drag as the difference of or distance between the two curves and would simplify the conversion to other aspect ratios. Such an insertion is never made. The curve of the induced drag coefficient is indeed different in each case, and has to be computed separately from the lift curve for each section from the equation given above in this article. It would still be well worth while to do so.

A third curve in this diagram gives the center of pressure in per cent of the chord. This is a very inconvenient curve, difficult to grasp, rather curved and often consisting of two branches running beyond the diagram. Theory indicates that the type of this curve is always the same, and that the travel of the center of pressure is characterized by one intensity. It would be desirable to have a simpler curve which would exhibit at a glance the intensity of the travel and the deviation of the actual travel from the theoretical one. The center of pressure curve, on the other hand, gives directly the most forward location of the center as such is practically needed. This curve therefore has much to recommend it.

There is a fourth curve in this diagram, giving the ratio L/D, the lift divided by the drag, plotted against the angle of attack. This curve is superfluous. It tells nothing which is not indicated in the three other curves; neither does it give values strictly characteristic for the wing sections, for the L/D depends very much on the aspect ratio.

With a standard aspect ratio, (of, say, six), the curve is indeed characteristic, but must not be confused with the L/D curve of the complete airplane, which alone has a practical meaning.

The described lift curve diagram is now well introduced and holds its place from mere inertia. People have become accustomed to it and keep on using it. After all, it is easy to understand the diagram; it is difficult only to see at a glance what it means. We shall come back to the question of how to facilitate this interpretation.

A second type of diagram, representing the same wing section characteristics, is the polar diagram. The polar diagram is as old as the lift curve diagram, and was originally used in France and Germany, whereas the lift curve diagram survived in England and America. In the polar diagram, all quantities are plotted to the right, not upwards against the lift coefficient which is plotted upwards. That is somewhat different from the conventional way of plotting several quantities against one quantity, but it really does not make much difference whether the whole diagram is turned around by 90 degrees or not. These directions were adopted in order to have the lift and drag in their natural directions, which is a good point.

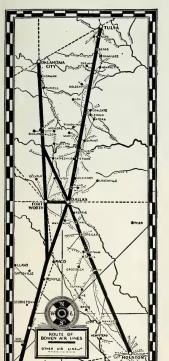
Against this lift coefficient first of all the drag coefficient is plotted to the right. That gives the so-called polar curve. It is further the general practice to plot the induced drag coefficient in the same way, also toward the right. That is always a parabola, and the same one with the same aspect ratio. It does not take much effort therefore to obtain the curve of induced drag in this diagram. The horizontal distance between the parabola of induced drag and the polar curve is directly the coefficient of profile drag. The polar diagram therefore shows at a glance the variation of the profile drag itself within the range of the lift coefficient, and for that reason tells so much more than the lift curve. As a third curve, the moment coefficient of the air force relative to a specified point of the wing chord is plotted to the right. This gives a much straighter and more instructive curve than the center of pressure directly. The moment refers mostly to the leading edge, sometimes to the 25 per cent point of the chord. In the latter case, the moment curve is theoretically vertical, and gives the intensity of the travel by its distance from the vertical axis of the diagram. The angle of attack is not plotted at all by a curve of its own, but its value is inserted at occasional points near the polar curve. The relation between the lift and the angle of attack is therefore seen to be somewhat neglected in the polar diagram, but that is the less important relation and at the same time the one which is most generally known previous to each test,

The polar diagram shows at a glance the two main relations which the lift curve diagram fails to show immediately: the variation of the profile drag, and the intensity of the travel of the center of pressure. Both diagrams show equally well the general variation of the lift at large angles of attack, and the regularity or irregularity of the variations of the air forces. The lift curve still appeals strongly to the designer. It is therefore necessary to seek devices by means of which the same information can be obtained as quickly as possible from this less advanced diagram.

First let us consider the intensity of the center of pressure travel. We obtain a good picture of it first by examining the lift curve, and ascertaining whether or not it runs straight and regularly near the lift coefficient 1.00. If it does, we deduct 25 per cent from the center of pressure at the lift coefficient 1.00. The difference is already

(Continued on following page)

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[FOR RUNWAYS, HANGAR FLOORS AND APRONS, AND DUST LAYING]

(Continued from preceding page)

a measure for the center of pressure travel, for it is proportional to the characteristic angle of the mean camber line of the section. Any other reasonably large lift coefficient (chosen in the same manner, once and for all) would likewise serve, the distance from the 25 per cent point being inverse to the lift coefficient. The lift coefficient 1 gives the simplest computation.

The induced drag is zero at the lift coefficient zero, and moreover, when plotted, is tangent to the axis. At  $C_{\rm L}=1$  it is  $1/6~\pi=0.53$  for the aspect ratio 6, and  $1/5~\pi=0.64$  for the aspect ratio 5. In the general case of the aspect ratio a the induced drag coefficient is  $1/a~\pi$ . Marking this point enables one to draw the curve of the induced drag tangent to the horizontal axis at the intersection with the lift curve. That gives a good picture of the variation of the profile drag.

Many designers are accustomed to the aspect ratio 6. For the aspect ratio 5, the difference of the induced drag coefficient at the lift coefficient 1 is  $(1/5-1/6)/\pi=1/30$   $\pi$  or about 0.01. A reduction curve for the drag is

drawn in as before through this point and tangent at the intersection of the lift curve and the horizontal, and the drag measured from it rather than from the horizontal

It is more desirable to compare the pure profile drags than the drags reduced to the standard aspect ratio 6, not, however, because it is in any way more perfect theoretically (that is a minor point) but principally because, with the aspect ratio 6, the induced drag overshadows too much the profile drag, and the several sections seem to be alike. They actually are with respect to the drag if employed in airplanes having likewise about the aspect ratio 6 or a smaller one. The drag of the sections is then of minor importance at large angles of attack. Wing sections may however be used in other ways, and the separation between their drag and the drag caused by the aspect ratio is then highly desirable.

(This is the fourteenth of a series of articles by Dr. Max M. Munk. Copyright 1931. All rights reserved.)

box girder ribs.

#### CIRRUS-POWERED FAIRCHILD "22"

In addition to the Rover-powered Fairchild "22", A.T.C. No. 408, Fairchild has brought out a model powered by the Cirrus engine, A.T.C. No. 438. In construction and flying characteristics the two planes are identical and the parts interchangeable. The only difference is an increase in performance obtained from the higher power of the Cirrus engine, which is 95 horsepower at 2,100 revolutions per minute in contrast to 78 horsepower at 2,000 revolutions per minute for the Rover engine.

The performance of the Rover job, unusual for a plane of this horsepower, is due primarily to the extremely clean design and the light weight of the plane. The 17 additional horsepower obtained with the Cirrus engine gives remarkable performance characteristics. Although the plane is advertised with a top speed of 115 miles per hour, speeds of 120 miles per hour have been obtained with some propeller settings. The rate of climb at the ground is 750 feet per minute.

This plane, like the Rover engine plane, is sold complete with airspeed indicator, altimeter, tachometer, oil pressure and temperature gauges, visible gasoline gauge, carburetor choke and carburetor heat control, brakes, low pressure tires, oil hydraulic shock absorbers with 8-inch travel, all metal ailerons, landing gear tread of 7 feet 7 inches, and stabilizer adjustment control in both cockpits. Both jobs have received much favorable comment for the ample room in their cockpits, which are 27 inches wide and 32 inches long.

The only unusual feature of this plane is the sharp leading edge which causes the plane to recover controls neturalized from a spin in an unusually quick manner.

| SPE                | CIFICAT                    | IONS                 |
|--------------------|----------------------------|----------------------|
|                    | Rover Engine               | Cirrus Engine        |
| Weight empty.      | 870 pounds                 | 926 pounds           |
| Gas 21 gallons     | 126 pounds                 | 126 nounds           |
| Oil 2 mallons      | 15 pounds                  | 15 pounds            |
| Dil-4              | 13 pounds                  | 13 pounds            |
| Filot              | 170 pounds<br>219 pounds   | 170 pounus           |
| Payload            | 219 pounds                 | 263 pounds           |
| Gross Weight.      | 1,400 pounds<br>78 @ 2,000 | 1,500 pounds         |
| Power              | 78 @ 2.000                 | 95 @ 2,100           |
| Power loading      | 17.95 lbs. per H.P.        | 15.80 lbs. per H.P.  |
| Wing loading       | 8.23 lbs. per sq. ft.      | 8 82 lbs per sq. ft. |
| Maximum            | 0.20 IDS. per aq. re.      | 0.00 tou. per adirec |
| speed              | 105 miles per hour         | 115 miles per hour   |
| Landing speed      | 43 miles per hour          | 46 miles per hour    |
| Rate of climb      | 650 ft. per minute         | 750 ft per minute    |
| Carrie of Cilitio, | 10,000 feet                | 10 TOO (             |
| Service cening.    | 10,000 reet                | 10,500 feet          |
|                    | 32 feet 10 inches          |                      |
| Chord              | 5º feet 6 inches           | 5 feet 6 inches      |
| Length             | 22 feet 0 inches           | 22 feet 0 inches     |
|                    | 8 feet 0 inches            |                      |
|                    |                            |                      |

#### GAS-HEATED SOLDER IRON

THE new "Torchiron" is a gasheated soldering iron recently introduced by the Reliance Specialties Manufacturing Company, New York City. Using the Torchiron, the operator has a continuously heated soldering iron for steady work. With the three-pound head, the fuel required is four or five cubic feet of gas per hour, and with the five-pound head, five or six cubic feet of gas per hour.

This iron is heated by either natural or artificial gas and low pressure air mixed by means of a needle valve and passing through a flexible hose to the handle of the torch.

Constant temperatures are increased or decreased at the option of the operator by regulation of the needle valve. The copper heads may be brought to a red heat within three to five minutes after lighting. The filing and cleaning, dipping and retinning of the coppers is practically eliminated, inasmuch as the copper heads are not exposed to the open flame.

Coppers are available in sizes ranging from one-half to five pounds. They also are made to specifications. The coppers are quickly interchangeable, being screwed onto the stainless steel tip. The "Torchiron" may be used as a torch as well as an iron.

#### GERMAN TRANSPORT AIRPLANES

(Continued from page 52) tings being mounted on specially strong

All BFW machines lend themselves particularly well to use as goods carriers because, after removal of the seats, the unobstructed space admits of loading even bulky goods. In the case of the M 20 b the free space available has a length of 19 feet, a breadth of 5.25 feet and a height of 6.8 feet. The floor space comprises more than 100 square feet to which must be added approximately nine square feet available in the small luggage compartment behind the cockpit. The total cubic contents of the loading

which must be added approximately nine square feet available in the small luggage compartment behind the cockpit. The total cubic contents of the loading space amounts to about 185 cubic feet. When the plane is to be used solely as a goods carrier it is provided with large loading hatches in place of doors and windows.

Either with the 12-cylinder watercooled BMW VI ZU developing 500 to 640 horsepower or the new air-cooled Siemens and Halske SH 20 radial motor delivering 500 to 600 horsepower may be used. The wing area totals 699.7 square feet and the full load flying weight amounts to 10,560 pounds, so the wing loading amounts to 15.1 pounds per square foot and the power loading with the motor to 16.5 pounds per horsepower. The plane's net empty weight is 6,575 pounds, leaving 3,985 pounds for the load, of which normally 1,875 pounds are taken up by the crew and fuel, so the payload amounts to 2,200 pounds. The maximum speed is given as 127 miles per hour; the normal cruising speed, 106 miles per hour; and the landing speed 56 miles per hour. Near the ground the machine is capable of climbing at the rate of 11.5 feet per second.

(Other German transport planes will be described by this author in forthcoming issues of Aero Digest.)

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## FAIRCHILD 22

OST gratifying endorsement and approval of the industry attended the introduction at the 1931 Detroit Show of the new and economical Fairchild 22—with its modern inverted, air-cooled Rover engine of 75 horsepower. ¶ Now the Cirrus (inverted) Hi-Drive engine of 95 horsepower is also available in this model. ¶ This is the second step in a determined drive to produce full quality, full performance, completely equipped airplanes at sensible prices. It belongs completely to this new, practical era of aviation. ¶ The "22", like its well-known predecessors, possesses the priceless Fairchild ingredient—"Stamina to give unfailing service under the most severe conditions". ¶ Complete details gladly mailed.

ROVER POWERED (105 M.P.H.) \$2675

CIRRUS HI-DRIVE POWERED (118 M.P.H.) \$2775



KREIDER-REISNER AIRCRAFT COMPANY



INC.

Hagerstown, Maryland



### CORBEN BABY ACE MONOPLANES

THE Corben Baby Ace, a light sport plane designed especially for student fliers, sportsmen pilots and flying clubs, is available either as an open-cockpit or a cabin ship. It is manufactured and distributed in semi-built construction kits or flyaway by the Corben Sport Plane and Supply Company, Peru, Indiana. The kits include fuselage, landing gear, controls and tail unit, factory welded.

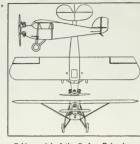
The open-cockpit model is a parasol monoplane and the cabin job, a highwing monoplane. The framework of the wings of either model is a spruce structure covered with fabric. Steel tubing covered with fabric makes up the fuselage and tail group. The wing struts and landing gear are of steel tubing. Aircraft bolts are used throughout. All fairings and streamlining are of balsa wood. The wings, tail unit, controls and landing gear are interchangeable with either the open or closed models. The wing struts are designed to eliminate the necessity of rigging. This facilitates the attachment or detachment of the wings to tow the ship to and from an airport or to store it in small space.

A detachable motor mount is provided to make it pos-ible to change types of engines without rebuilding the plane. The Corben company offers the Baby Ace with the choice of the following engines: Szekely SR-3 of 45 horsepower; Continental A-40 of 35 horsepower; Salmson A-D-9 of 40 horsepower; and the Heath B-4 of 30 horsepower.

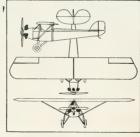
The landing gear is of the split-axle type. Wheels 20 inches by 4 inches, tires, tubes, shock struts and tail wheel are provided.

#### Specifications

| Span (open model)25 feet 4 inches      |
|----------------------------------------|
| Span (closed model)27 feet 8 inches    |
| Height overall                         |
| Length overall                         |
| Weight empty (open model)400 pounds    |
| Weight empty (closed model) 475 pounds |
| Useful load 300 pounds                 |



Cabin model of the Corben Baby Ace



Open type of Corben Baby Ace

#### Performance

| (With Szekely SR-3 Engine)         |
|------------------------------------|
| ligh speed95 miles per hour        |
| cruising speed80 miles per hour    |
| anding speed30 miles per hour      |
| Take-off (200-pound load)4 seconds |
| Rate of climb (200-pound load)-    |
| 700 feet per minute                |
| ruising radius300 miles            |

#### 

THE experimental investigation recorded in N.A.C.A. Report 361,
Montgomery Knight and Thomas A.
Harris, was conducted primarily for the
purpose of obtaining a method of correcting to free air conditions the results of
airfoil force tests in four open wind tunnel jets of different shapes. Tests were
also made to determine whether the jet
boundaries had any appreciable effect on
the pitching moments of a complete airplane model. The investigation was conducted in the atmospheric wind tunnel of
the Langley Memorial Aeronautical Laboratory.

The method of obtaining the airfoil corrections utilized the results of force tests made in each jet on three similar monoplane airfoil set-ups of different sizes. The data from the tests in one of the jets which was circular were extra-polated to the condition of infinite air space, and the results were found to agree with those obtained by means of Prandil's theoretical method of correction. On this basis corrections were then obtained for all the other airfoil tests.

Satisfactory corrections for the effect of the boundaries of the various jets were obtained for all the airfoils tested, the span of the largest being 0.75 of the jet width. The corrections for angle of attack were, in general, larger than those of drag. The boundaries had no appreciable effect on the pitching moments of either the airfoils or the complete airfoils or

Report 361 may be obtained upon request from the National Advisory Committee for Aeronautics, Washington, D.C.



Szekely-powered high-wing open-cockpit Corben Baby Ace monoplane



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#### ITALIAN AIR TRANSPORT

Statistics of the Italian Civil Air Lines (Statica delle linee aeree civili Italiane Anno 193' Ministero dell'Aeronautica, 326 pp., 10 charts.

D ATA regarding the civil air services in Italy during 1930 are given by the Italian Air Ministry individually for each of the 24 lines as well as in total, but little information regarding the equipment employed is included. During this period, 38,361 passengers, 41,674 kilograms of mail, 474,759 kilograms of baggage, and 137,610 kilograms of freight were carried, July being the most popular month for passengers, September for mail, and May for merchandise.

During this year 4,438,912 kilometers were flown. In regard to traffic at the Italian airports, 14,265 airplanes arrived and departed, carrying 70,212 passengers, 120,082 kilograms of mail, and 1,214,145 kilograms of baggage and freight. Among the passengers classified by nationality, 1,771 Americans are said to have flown on Italian lines. According to the accident table, in the four accidents which took place, 12 passengers were killed and 11 injured. Charts compare the statistics with those of 1926, 1927, 1928, and 1929.

#### VARIABLE-PITCH PROPELLERS

Experiments with a Propeller for All Working Periods and for Different Values of Pitch-Diameter Ratio (Esperimenti su cliche per tutti gli stadii de funzionamento e per diversi valori del ropporto passo-diametro), A. Faraboschi. Aerotecnica, Vol. II, No. 4, April, 1931, pp. 395-410, 7 figs.

EXPERIMENTAL results obtained with a variable-pitch propeller are discussed. In the first of the series of tests, the aero-dynamic characteristics were determined in all the working periods for a pitch-diameter ratio of 0.89, while in the second series, the characteristics in the propulsive and turbomotive periods were found for values of the pitch-diameter ratio varying between 0.5 and 162

After the linear variation of the thrust coefficient in the turbo-motive period was found, the maximum value of the strength modulus was shown to take place for a value of the slip ratio at double the aerodynamic pitch. For the deceleration period, a characteristic hollow on the curves of the thrust and torque coefficients were proved theoretically and qualitatively. The slopes of the thrust and torque coefficient curves corresponding to the lower aerodynamic pitch were determined, confirming the fact that the slope of the thrust coefficient curve was almost independent of the pitch-diameter ratio, while the slope of the torque coefficient curve increased with the increase of pitch-diameter ratio.

#### SEAPLANE DESIGN

Some Aspects of the Design of Sea-Going Aircraft, A. Gouge. Royal Aeronautical Society Journal, Vol. 35, No. 245, May, 1931, pp. 341-365 (and discussion), pp. 365-371, 25 figs.

THE method and procedure adopted by the firm of Short Brothers when starting a new design of a flying boat or seaplane are described by the general manager and de-

#### Elsa Gardner

signer of that firm. The apparatus and means of carrying out tank tests on models are discussed and the curves derived are interpreted. Tests applicable to floats only are taken up and the results of tests of the singlefloat type compared with those of the twinfloat type, to the former's advantage. Research work undertaken in the past year on the company's testing tank is outlined. The effect of non-standard conditions on take-off of a flying hoat or seaplane and the variation in the weight of floats when compared with their displacement are explained. In concluding the author draws attention to two points in design which have resulted in a considerable cleaning up of the air frame and consequent increased overall efficiency of the machine in the air, namely the singlestrut engine mounting and the absence of chin struts.

#### AERODYNAMICS

High Lifting Surfaces and Hyper-Lifting Profiles (Portances élevées et profils hypersustentateurs), F. Haus. L'Aéronautique, Vol. 13, No. 143, April, 1931, pp. 125-131, 17 figs.

THE results of various investigations of a means for obtaining greater lift with lifting surfaces are reviewed, covering the theory of circulation, elliptical distribution, and the case of a wing with a variable chord Causes of limitations to the maximum lift of ordinary wings are determined, and rendeles for burbling are proposed. It is shown that certain means effect the circulation directly while others have only an indirect effect, being limited to hindering the burbling without taking part part in creating the

The practical Use of Devices for Obtaining Aditional. Lift (Lumlisation practions des procedes d'hypersuscentation). F. Haus. L'Aferonautique. Vol. 13, No. 148, June. 1931, pp. 205-213, 17 figs. THIS is a continuation of an article published in the April issue of the magazine, and deals in greater detail with the practical use of wing slots and other devices for securing additional lift on airplanes. In considering the advantages of slotted wings the author takes up the questions of where the slots may best be located and what profile they should be given, and discusses the value of slots in the center and front of the

wing, and in combination with control of

camber, as well as the influence of size of

The system with jets of air, or bellows wings, is shown to give increases in lift of the same value as that obtained by slotted wings. The author quotes the results found by the N. A. C. A. at Langley Field, Katzmayr at Vienna, and Seewald at the Deutschen Versuchsanstalt für Luftfahrt with this type of wing, and compares them. He also tells of the experiments of the N. A. C. A. and of Schenk at Göttingen with wings with a suction device, and explains the influence of all these lifting devices on the stability of the plane. He shows

the value of automatic slots, and the advantages to be derived from joining slots with ailerons. He also comments upon the use of vanes as wings or pilot planes.

#### RADIATORS

Drag and Heat Dissipation of Three Radiator Systems, E. T. Jones. (British) Aeronautical Research Committee—Reports and Memoranda No. 1366 (Ac. 493), August, 1930, 14 pp., 12 figs.

THE experiments described were made to ascertain the change of performance of an airplane with a radiator fitted with different fairings and shutters, but operating at the same cooling capacity. The level speed and maximum rate of climb of a Fairey Fox airplane were measured with three radiator systems adjusted to give, in turn, their maximum and minimum cooling. The cooling capacity of each radiator system was also determined and the performance results interpolated at the same radiator and air temperatures. The drag of each radiator was deduced from the performance results and compared qualitatively with wind tunnel results

The top speed and maximum rate of climb at an aneroid height of 5.000 feet when fitted with the radiator systems adjusted to give the same inlet temperature of 90 degrees Centigrade when operating in the maximum English summer temperature (14.6 degrees Centigrade) were compared. An analysis of the wind tunnel results placed the radiators in the same order of merit as in the full-scale tests, namely, without a radiator, with a retractable radiator, with a faired underslung radiator, and with an unfaired underslung radiator. The virtual drag of the exposed radiator unshuttered and unfaired was proportional to the area exposed, and was approximately 15 per cent greater than the free drag measured in the wind tunnel.

#### FUSELAGE INTERFEREINCE EFFECT ON MONOPLANES

The Influence of a Fusclage on the Lift of a Monoplane, A. S. Hartshorn. (British) Aeronautical Research Committee—Reports and Memoranda No. 1344 (Ac. 476), May, 1930, 15 pp., 10 figs.

THE available model and full-scale results for monoplanes were examined to determine the interference effect of the fuse-lage on the lift of a monoplane, special attention being paid to the maximum lift attaniable. Both model and full-size results suggested that the position of the body relative to the wing had a large influence on the maximum lift attainable.

With the wing flush with the top of the body the maximum lift was practically equal to that of a continuous airfoil. As the wing approached the under-surface of the body, the spoiling effect was increased and modified to an increasing extent by the airfoil characteristics, a thick wing section having given the worst interference. Model results suggested that the body shape had a large influence on the interference effect, having been most beneficial with a deep cabin type, but there was not sufficient information to provide a simple rule for estimating the

(Continued on following page)



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(Continued from preceding page) magnitude of the influence of the body shape.

#### METEOROLOGY AND GLIDING

The Meteorological Aspects of Gliding and Soaring Flight, F. Entwistle. Royal Aeronautical Society Journal, Vol. 35, No. 246, pp. 423-449, (E. 45), November, 1910, 9 pp., 3 figs.

THE present state of knowledge in regard to disturbed wind conditions is reviewed, some of the more important practical applications to gliding and soaring flight are considered, and a possible program of further investigation and development is suggested. The magnitude and extent of vertical currents, the choice of a gliding site, dynamic soaring, auto-towing, and long distance soaring are discussed in detail.

In order to increase the present knowledge of wind structure, particularly with regard to air circulation within and around different cloud formations, and the magnitude and extent of vertical currents generally, the author suggests observations made from the ground by means of pilot balloons, the use of free balloons carrying self-recording instruments (registering balloons), the use of powerdriven aircraft fitted with suitable instruments, and the use of sailplanes suitably equipped.

#### AIRPLANE MANUFACTURE

Light Airplane Production, G. H. Handasyde. Aircraft Engineering, Vol. 3, No. 28, June, 1931, pp. 131-133, 7 figs.

THIS is the first of a series of articles surveying methods of production in use at various airplane and airplane-engine factories, and gives a critical description of the DeHavilland works at Edgeware, England, and the construction of the Moth airplane.

The author comments on the almost entire absence of machined parts in the main structure of the wings and fuselage. The latter is built up from steel tubes varying from 5/8 to 3/8 inches in size, of either round or square section and from about 20 to 22 gauge thickness so that the tubes are small and rather thin for easy welding. In the majority of cases, the wings are of wood. The fuselage is built up in a series of operations, requiring a large number of special jigs. All metal parts and tubes are given two coats of stove enamel inside and out, except in the case of closed tubes which are sealed air-tight so that no internal corrosion can take place.

#### STEEL TUBE MANUFACTURE Seamless Steel Tubes for Aircraft, A. Reynolds. Aircraft Engineering, Vol. 3, No. 28, June, 1931, pp. 141-143, 5 figs.

PROCESSES and plant employed in the manufacture of cold-drawn seamless steel tubing are described by a member of the Revnolds Tube Company. The pilgering, push-bench, and barrel-rolling methods of producing hollow blooms, which form a basis for cold drawing, are explained in detail. The author points out that, for aircraft work, all blooms whether low, medium or high carbon. or alloy steel, are normalized at the appropriate temperature for the particular steel used, this heat treatment relieving all the stresses set up in the metal by the previous hot working. The results obtained with the mandrel and plug drawing methods are compared. The most suitable materials for welding are discussed.

The use of tapered gauge tubes and its manufacture are taken up with reference to tubes of 15 feet in length which were made for autogiro blade spars. Their thickness is tapered practically the whole length, a short parallel portion being formed at the inner end. The tubes are made from airhardened nickel-chrome steel and are hardened and tempered to give an ultimate strength of 85 tons per square inch.

The author points out that with increased use of high-tensile tubing, individual testing of tubes is necessary. He describes and illustrates a new machine for proof-bend testing of tubes, which was built to test a very large range of sizes, the bending moment being applied by hand for the smaller sizes and by hydraulic power for the larger.

#### GASOLINE PUMPS

New Gasoline Pumps (Nouvelles pompes a essence). L'Aèronautique, Vol. 13, No. 145, June, 1931, pp. 224-228, 16 figs.

OMPLETE details of three new fuels COMPLETE details their design expumps are given, and their design explained. The new A. M. vane-type rotary fuel pump is self-regulated. It is designed to operate at a speed of 800 to 1,000 revolutions per minute and can be driven at half the motor speed. The F. I. A. T. piston pump is composed of two groups of three cylinders in line, each group being arranged at 180 degrees. The circulation of gasoline in the Fiat engine by means of this pump is described. The Junkers Jumo self-regulated pump is composed of three pumps in which the phases are arranged at 120 degrees, and is similar in many respects to the fuel-injection pumps used on the heavyoil engines.

#### FIRE PREVENTION

Increasing the Safe Operation of Aircraft by Reducing the Danuers of Fire (Erhöhung der Sicherheit von Luft'ahrzeugen durch Bekämpfung der Brandesfahr). F. Kühn. Zeitschrift für Flugtechnik und Motorluttschiffahrt. Vol. 22. Nos. 7 and 8. April 14 and 28, 1931, pp. 197-206 and 241-244.

AUSES of fire shown in statistics and CAUSES of the shows. to fire in the air as well as during construction and in hangars. The prevention of fire is taken up in detail regarding motor gases, fuel and oil transmission, fuel pumps, armatures, fuel and oil containers, exhaust manifolds, warming-up devices, and ignition. Requirements of a fire wall, materials for engine cowling, and precautions against backfire and for tanking in the air are also considered.

With reference to fighting fire, general data on fire extinguishers is given while arrangements of automatic extinguishers for motor fires, and their location in single and multi-motored planes, and in the exhaust-gas stream are suggested. Tests of extinguishers were made on the fuselage of an old Fokker airplane with a Mercedes III

Report of the Deutschen Versuchsanstalt für Luftfahrt.

#### COMPRESSION RATIO OF DIESEL ENGINES

The Limits of Compression Ratio in Diesel Engines, D. R. Pye. (British) Aeronautical Research Committer—Reports and Memo anda No. 1365, E. 45), November, 1930, 9 pp., 3 figs.

T HE results of experiments to determine the limits to which the compression ratio in the high-compression fuel-injection engine may be usefully raised are discussed. Values obtained in experimental compressionignition engines of 12 and 15 to 1 compression ratio are given and these are compared with the calculated efficiency of theoretical cycles of compression ratio between 10 and 20 to 1, in which a limit is placed upon the maximum pressure to be allowed in the

It is concluded that substantial gains of economy may be achieved by raising the compression ratio to 15 to 1, provided that difficulties of design in regard to the shape of the combustion chamber can be overcome: but that from an examination of the theoretical cycles it appears unlikely that any advantage would be obtained by raising the compression ratio further so long as maximum cylinder pressures are limited to about 900 pounds per square inch.

#### CARBURETORS FOR AIRPLANE ENGINES

Carburetter Fuel Metering Characteristics, W. C. Clothier. (Britisb) Aeronautical Research Committee-Reports and Memoranda No. 1361, (E. 43), December, 1930, 12 pp., 37 figs.

THE tests described were undertaken to determine how much the variation in mixture strength, which is caused by the changes of fuel temperature during flight. may be reduced by fitting sharp-edged (knife-edged) fuel metering orifices to carburetors. A Claudel-Hobson type A, V. 48 C. carburetor, suitable for an 80-horsepower engine, was calibrated using an 80/20 gasoline-Benzel mixture at various temperatures, kerosene and white spirit. A constant inlet air temperature was maintained throughout the test to reduce variation due to change of air density. The coefficients of discharge for the various orifices were determined over a range of conditions from flow tests apart from the carburetor.

At full throttle, the carburetor as supplied showed very little change of mixture strength with fuel temperature from plus 20 to minus 30 degrees Centigrade, over an air-flow such as is likely to occur in service. At part throttle, there was considerable weakening with decreased temperature. Over a large temperature range, plus 20 to minus 50 degrees centigrade. weakening of the mixture strength with temperature occurred especially at the low air flow and at part throttle. When fitted with sharp-edged orifices the mixture became rich with decreased temperature, the increased mixture strength being greater than the variation given by the original jet at full throttle, but less at part throttle.

Flow tests of jets with various shaped orifices, not fitted to the carburetor, showed that sharp-edged orifices have constant discharge coefficients over a large temperature range, and give rich mixtures at low temperatures due to increased density.

AUGUST, 1931



· Safety, comfort, "on-time" transportation-the demand of the airline passenger today. Dependable performance with an economy that insures legitimate profit—the need of the airline management. No other plane in the world has ever combined all these requirements as they are combined in the big 15-place Bellanca Airbus. This single-engined monoplane type, designed by Bellanca and built as only Bellanca can build, has proved itself in service a worthy descendant of all the Bellancas that have performed\* so brilliantly in the great reliability tests of history.

#### BELLANCA AIRBUS

Safety is attained by Bellanca-perfected flying qualities, balanced control and rugged construction; moreover, safety in the single-engined plane is attested by all of aviation history.

Comfort is achieved in the smooth steadiness of the plane; the well-cushioned seats; and the quiet of its single power plant, mounted far in front of the cabin.

Cruising Speed is 120 miles an hour, and range is 600 miles.

Pauload is twice that of other single-engined transports of similar horsepower; 14 passengers and 500 lbs. of baggage; or 11 passengers and 1,075 lbs. of baggage, freight and mail.

Operating cost is half that of multi-engined airplanes of similar load capacity; the single Cyclone (or Hornet) engine being economical and utterly reliable in operation:

The result of these facts is that the Bellanca Airbus earning capacity is far beyond that of any other airplane

#### \*BELLANCA MONOPLANES HAVE WON

National Air Race Efficiency Contests nine times since 1923.

American Endurance Record three times since

World's Endurance Record twice since 1927, Pilots Lees and Brossy establishing same at 84 hrs. 33 min., May, 1931, in their Packard-Diesel-powered Bellanca Pacemaker.

Ford Reliability Tour (single-engined cabin plane class) twice since 1929. World's Long Distance Record in 1927, over

4,000 miles non-stop from U. S. to Germany. Commercial Airplane Altitude Record in 1930, 30,453 ft., by Capt. George Haldeman.

Transatlantic Flights-in "The Columbia," twice across; also, non-stop to Bermuda and return. In "The Pathfinder," from Maine to Spain. In "The Liberty," non-stop to Germany.

All Bellanca Aircraft Manufactured Under Department of Commerce Approved Type Certificate

#### BELLANCA AIRCRAFT CORPORATION

New Castle, Delaware

Chrysler Building, New York

Bellanca Aircraft of Canada, Ltd., Montreal

BELLANCA

#### Approved Type Engines Now in Production (Continued from April Issue of Aero Digest)

Specifications: Length overall (less starter), 35% inches. Diameter overall, 48/2 inches. starter), 35% inches. Diameter overall, 48½ inches. Mounting bolt circle, 17½ inches. Bore, 4½ inches. Stroke, 5 inches. Displacement, 612 cubic inches. Weight dry (less hub and starter), 400 pounds. Fuel consumption, 55 pounds per horsepower per hour. Oil consumption, .025 pounds per horsepower per hour. horsepower per hour.

norsepower per nour.

The Comet Model E is a seven-cylinder four-cycle air-cooled radial aircraft power-plant developing 165 horsepower at 1,900 revolutions per minute. Compression ratio is 5,2. Dual Scintilla magnetos and a single Stromberg carburetor are provided as standard equipment. The lubrication system is of the pressure type, dry sump. There is one intake valve and one exhaust valve per cylinder. The propeller drive is direct. Heywood starter is provided for.

The pistons are of the trunk type, Bohna-



Comet Engine Corporation Madison, Wisconsin

lite. There are four piston rings per piston. The cylinder heads are Y alloy, screwed on. The cylinder barrels are steel A.E. 1050. The crankcase is aluminum. No. 12.

Standard equipment includes carburetor air heater, nose cowling, tool kit and exhaust manifold, complete. Spark plugs are placed on the sides of the cylinder head to give uniform spark plug temperatures. The crankshaft is carried in roller bearings and is of two pieces for use of a solid master rod. The cam is ball bearing mounted.



#### **CURTISS-WRIGHT**

CYCLONE R-1750-EG Wright Aeronautical Corporation Paterson, New Jersey

Specifications: Length overal1 starter), 46 11/16 inches. Diameter over-all, 54 11/16 inches. Mounting bolt circle, 2334 inches. Bore, 6 inches. Stroke, 6.875 inches. Displacement, 1,750 cubic inches. Weight dry (less hub and starter), 920 pounds with 2 to 1 ratio; 895 pounds with 1.58 to 1 ratio. Fuel consumption, 55 pounds per brake horsepower per hour. •Oil consumption, .035 pounds per brake horse-

power per hour.

The Wright Cyclone R-1750-EG is a nine cylinder four-cycle air-cooled static radial aircraft powerplant developing 525 horsepower at 1,900 revolutions per minute. Compression ratio is 5.1. Dual Scintilla magnetos are provided. Carburetor is Stromberg. The lubrication system is full pressure and dry sump. There are two vales per cylinder, one intake valve and one exhaust valve, Thompson or Rich. The propeller drive is geared 2 to 1 ratio or 1.88 to 1 ratio. The starter provided for is Eclipse hand inertia or hand and electric inertia. The pistons are alluminum casting, trunk

hand inertia or hand and electric inertia. The pistons are aluminum casting, trunk type, made by the Wright company. There are five piston rings per piston, U. S. or American Hammered. The cylinder heads are aluminum casting, Wright. The cylinder barrels are chrome-nickel steel forge, sleeve type, Wright. The cranksee, made by Wright, is aluminum casting. Equipment includes new "E' type cylinder barrels are chrome-nickel steel forget in the company of the company of the cylinder barrels are the company of the cylinder barrels are the cylinder barrels are considered to the cylinder barrels are considered to the cylinder barrels are cylinder barrels.

der heads with spark plug coolers, and integral cast rocker support boxes.

Specifications: Heigh overall, 47 inches. Diameter overall, 45 inches. Bore, 5 inches. Diameter overall, 49 inches. Bore, 5 inches. Stroke, 5½ inches. Displacement, 973 cubic inches. Weight dry (less hub and starter), approximately 630 pounds. Fuel consumption, 55 pounds per brake horse-power per hour. Oil consumption, 035 pounds per brake horsepower per hour. Displacement of the proposer per hour. The Wright Whirlwind 300-geared R-975-EG, is a nime-cylinder four-cycle air-

cooled static radial aircraft powerplant developing 300 horsepower at 2,000 revolu-tions per minute. Compression ratio is 5.1. Dual Scintilla magnetos are provided. Carburetor is Stromberg. The lubrication system is full pressure, dry sump. There is one intake valve and one exhaust valve per one make valve and one exhaust valve per cylinder. The propeller drive employs re-duction gears with a 2 to 1 or 1.58 to 1 ratio. The starter provided for is Eclipse hand inertia or hand and electric.

#### **CURTISS-WRIGHT**

WHIRLWIND 300-GEARED R-975-EG Wright Aeronautical Corporation Paterson, New Jersey

The pistons are of the trunk type, aluminum casting, product of Wright. There are four compression rings per cylinder, manufactured by U. S. or American Hammered. The cylinder heads are aluminum casting, Wright.

The cylinder barrels are chrome-nickel steel forgings, Wright. The crankcase is

aluminum casting, Wright.

Equipment includes the new "E" type cylinder heads with spark plug coolers, in-tegral cast rocker support boxes, tangential manifold and supercharger centrifugal band type clutch.





#### MacCLATCHIE **PANTHER**

MacClatchie Manufacturing Company Compton, California

Specifications: Opecifications: Length overall (less starter), 36% inches. Diameter overall, 36 inches. Mounting bolt circle, 17% inches. Broke, 5 inches. Displacement, 612.25 cubic inches. Weight dry (less hub and starter), 48 pounds. The MacClatchie Panther is a seven-pilinder four-cycle air-cooled radial L-head Length overall

aircraft powerplant developing 150 horse-power at 1,900 revolutions per minute. Compression ratio is 5.1. Dual Scintilla mag-netos and a single Stromberg carburetor are provided as standard equipment. The lubrication system is of the pressure type, dry. There is one intake valve and one exhaust valve per cylinder, tulip type. The propeller drive is direct. Starter is provided for.

The pistons are die cast, aluminum alloy with three compression rings and one oil ring. The cylinder heads are Y aluminum alloy, screwed and shrunk on forged steel barrels, finned to provide for even cooling barrels, finned to provide for even cooling throughout. The spark plugs are countersunk into the port plugs. The crankcase is four section, aluminum alloy. The crankcase is sections are joined together with a taper and spline. The cam is four lobe, single articled and the section are consistent of the spark plug and spline. The cam is four lobe, single rivieted to cam give, mirried, ground and rivieted to cam give, mirried, ground and without dismantlips. The master rod aswithout dismantling. The master rod as-sembly is nickel steel, I-section master rod and six drop forged tubular link rods.

AUGUST, 1931



This Goodrich Low Pressure Tire has cushioned thousands of vertical landings —will cushion thousands more.

### IT DOESN'T EVEN MAR THE TURF



### ... this Autogiro equipped with Goodrich

#### LOW PRESSURE TIRES

3000 pounds of airplane pause lightly in mid-air. Five thousand feet below lies a golf course—a mere green patch in the sunlight. For a moment the plane hovers. Then slowly—slower than a man in a parachute—this new miracle of the air descends. Settles to earth so gently you're hardly aware of the landing. A light bounce—a recoil—it doesn't even mar the tur!! That's Autogiro...Autogiro equipped with Goodrich Low Pressure Tires.

Goodrich Low Pressure Tires are fit companions to this latest aëronautical triumph. In them Pitcairn Aircraft, Incorporated, has found the same rugged dependability—the same extra margin of safety that make Goodrich Low Pressure Tires the first choice of airmen everywhere.



Autogiro, the newest miracle of the air, chooses Goodrich Low Pressure Tires.

## Goodrich

#### RUBBER FOR AIRPLANES

Another B. F. Goodrich Product



#### DEMONSTRATION FLIGHTS OF THE NEW NB TRAINER

#### By Jack Whitaker

NTERESTING demonstration flights of the new two-place side-by-side trainer produced by the Nicholas Beazley Airplane Company, Inc., of Marshall, Missouri, have demonstrated the unique flying characteristics of this new production job.

With the stick in neutral position and held there by a special stabilizing device which is incorporated in the control system, the NB Trainer in calm air will take itself off with the engine turning at from 2,000 to 2,300 revolutions per minute. In calm air it will take itself off without attention from the pilot. After gaining altitude and with power at cruising speed in calm air, the stabilizing adjusting device may be set so that the ship flies hands and feet off for any length of time. Left and right banks can be made with rudder only, without touching the stick. From level flight at cruising speed it is possible to climb and dive by leaning slightly forward or backward in the cockpit. Pulling the ship up into a stall and holding it there, the ailerons still give control even into complete stall and after the nose drops. The nose drops gradually and comes out at five or seven degrees below the horizon, recovering immediately. After the ship has been stalled and the nose drops it is not necessary to dive and gain flying speed in order to regain control; it has control throughout this entire operation. Furthermore, during this maneuver it does not lose altitude to an appreciable extent, nor does it mush considerably. The only time the ship loses altitude is for a short period while the nose is dropping from complete stall to level flight position.

When the ship is put into a nose high slip position, crossing the controls and diminishing power until the nose would normally drop off into a spin, no spin results, but the ship slips out sideways and comes out level. This occurs in either left or right

maneuver of this type. Next when the ship is pulled to the top of a stall and a wing dropped, the nose drops as before and the ship comes out into a slight bank on the side of the down wing, but does not fall off into a spin. This may also be tried on the opposite side with the same result. In a wing-over, releasing controls at the top of the maneuver after the reverse is started. we find that the ship levels itself out in position to regain normal level flight. Bringing the job around into a loop with only sufficient power to come around the top, we find that at the top of the loop we have as much control here as we do in level flight. A short flip loop can be accomplished quickly and with no undue strain on the ship.

We find it impossible to hold the ship in a spin more than one and one-half to two turns. Leaving the controls alone, the ship will not spin at all from any stall position: to get into a spin it is necessary to force the ship deliberately into it. If the controls are released as soon as the ship gets into the spin, it will come out of its own accord. This has been tried from various angles and positions to be certain there is no trick about it and that the ship will not get into a spin and wind up tightly in some peculiar position. After repeated efforts in both right and left spins, it has been found that the ship will not stay in; it is difficult even to get the ship into the beginning of a spin.

At a thousand feet or so after cutting down the power to idling speed, it is possible to pull the stick back and float around. By adjusting the stabilizing unit during this maneuver we find that the tail drops slightly and that under certain conditions the ship acts much like a sailplane and is supported by updrafts of air currents. When we have a fifteen or twenty-mile wind and can nose into it over the edge of the town or when the wind comes off the prairies and strikes the trees and buildings, we can maintain altitude indefinitely. From our field, which is three miles south of town, we have flown several times above our city at about 3,000 feet for a period of from four to ten minutes' duration, maintaining our altitude throughout. Neutralizing the stabilizing unit, we drift back to the field from 2500 feet to 3.000 feet. Arriving over the hangar with several hundred feet to spare and resetting the control with tail down position. we proceed to interest the ground crew by making 350-degree flat turns down wind tail down, in what is from the ground apparently a stall position, without any tendency to fall off. Then to prove the control at this speed we wiggle the tail with the rudder and wag the wings while still in the tail down or stall position. We have absolute control of the plane during this maneuver. Releasing our adjustment to nose down slightly and circling the field slowly again. we come in for a landing in a small space in front of the hangar.

This being accomplished, we take the ship off again into a stall climb as soon as tail is up. We then bring the ship around the field and into a landing position, but instead of landing this time, when about six feet from the ground the stabilizing control unit is again set, dropping the tail down the engine is throttled down to about 1,000 revolutions per minute, the field is crossed at about 15 miles per hour with the tail skid almost touching and the ship in an almost stall position. This can be repeated as many times as desired and during this maneuver the stick may be flexed and the wings wagged, showing that the ship is still in possession of lateral and longitudinal control.

From an altitude of 1,500 feet above the field the ship has been landed vertically several times, without damage. Its rate of descent has not yet been measured, but it appears to be as slow as a parachute. All of the above maneuvers with the NB Trainer were accomplished by a capable pilot, but the ship has been handled by an inexperienced pilot, under the supervision of an instructor (the seating arrangement is side-by-side) and with plenty of altitude the student has attempted to get the ship into trouble.









New NB Trainer, powered with Radial Air-Cooled engine, showing folding wings for easy ground transportation

# Zooming



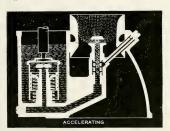
## POWER

WHEN a pilot opens the throttle quick-ly, he wants smooth and positive acceleration. It is his greatest factor of safety in many tight situations.

Temporary enrichment of mixture required for such acceleration is automatic with Stromberg Aircraft Carburetors. That's why so many good pilots prefer them. The accelerating pump, for use on engines which require a large accelerating charge for cold weather operation, is a new and exclusive Stromberg construction. It gives a positive and definite accelerating charge, under all conditions, regardless of the situation existing in the carburetor. This charge is delivered in a momentary spurt of fuel followed by a sustained discharge, lasting several seconds.

Stromberg's background represents 22 years of experience and research. Perhaps their engineers can be of service to you.

Stromberg Carburetors are used on over 95% of the aircraft engines now being built in the United States



TROMBERG RBURETORS

BENDIX STROMBERG CARBURETOR COMPANY
SUBSIDIARY OF BENDIX AVIATION CORPORATION

701 BENDIX DRIVE . SOUTH BEND, INDIANA

#### RECENT PATENTS

THE following patents of interest to readers of AEBO DIOSET recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, 1343 H Street, N.W., Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

Adustable engine for aircraft. Thomas F. Hamilton, Milwaukee, Wis., assignor to Hamilton Standard Propeller Corp., West Homestead, Pa. (No. 1,806,680.)

Detachable joy stick for aeroplanes. Charles F. Seaton, Elyria, Ohio. (No. 1.806.716.)

Gun-mount for aircraft. William Wait, Js., Garden City, N. Y., assignor to Clarence M. Vought, Great Neck, N. Y. (No. 1,806,724.)

Shock-absorbing landing strut for aeroplanes. Friederika Kunderd, Elkhart County, Ind. (No. 1.806.807.)

Aeroplane. Joseph Preatka, New York, N. Y. (No. 1.806.822.)

Mechanism for supplying fluids from one airship to another while in flight. Jennie Ullendorff, Portland, Ore. (No. 1.806.833.)

Mechanism for supplying fluids from one airship to another while in flight. Jennie Ullendorff, Portland, Ore. (No. 1,806,834.) Aeroplane. Wister P. Bott, Homer, La.

(No. 1,806,870.)

Wing control for aircraft. Benjamin F. Aldrich, Milwaukee, Wis. (No. 1,806,927.) Propeller-hub. John W. Smith, Philadelphia, Pa. (No. 1,807,179.)

Safety braking mechanism for airplanes. Wayne Buerer, Reno, Nev. (No. 1,807,194.) Construction of aeroplanes. Victor Ehmig, La Garenne Colombes, France. (No. 1,807,-203.)

Helicopter. Ralph Tarshis, Brooklyn, N. Y. (No. 1,807,353.)

Heater for propellers. William Waters, Boston, Mass. (No. 1,807,359.)

Aeroplane air station. Joseph Olaszy, Linden, N. J. (No. 1,807,429.)

Airship. Hiram P. Miner, Mission Ridge, S. Dak. (No. 1,807,542.)

Airship. John C. Schleicher, New York,

N. Y. (1,807,710).

Aircraft, including seat for same. Igor Skindsrky, College Point, N. Y. (1,807,939). Airplane and method of making same. Ralph H. Upson, Detroit, Mich. (1,807,946). Aeroplane. Wiliam R. Reed, Baltimore, Md. (1,808,005).

Airship. George G. Duering, Fort Bliss, Tex. (1.808.132).

Airplane control. Roland Chilton, Keyport, N. J., assignor to Aeromarine Plane & Motor Co., same place. (1,808,342).

Control for airplanes. Michael H. Depue, Homer, Ill. (1,808,344).

Airplane engine. James M. Royal, Villa Park, Ill. (1,808,380).

Aircraft power generating system. Constantine A. Serriades, Chicago, Illinois. (1,808,439).

Aeroplane wing. Gerald L. Huiskamp, Keokuk, Iowa. (1,808,464). Aeroplane. Alexander Smith, Pittsburgh, Pa., and John Schmidt, New York, N. Y. (1.808.688).

Airplane automatic control. Albert E. Elsea, East St. Louis, Ill. (1,808,771).

Propeller. Ole Fablin, Sioux City, Iowa.

(1,808,888).

Flying machine. Frank Steinmann, sr., De Soto, Mo. (1,808,908).

Steering gear for airships. Jesse D. Langdon, Los Angeles, Calif. (1,808,991).
Airplane. Royall H. Royster, Oxford, N. C. (1,808,996).

Non-sinkable aeroplane body. Louis Nycz, Binghamton, N. Y. (1,809,061).

Supporting means for hangar doors. Donald E. Willard, Danville, Ill. (1,809,093).

Driving gear for airships of the rigid type. Johann Schuette, Lichterfeldeost, Germany. (1,809,220).

Aircraft. Max B. Pupp, Souderton, Pa. (1,809,253).

Propulsion of aircraft. Robert H. Goddard, Worcester, Mass. (1,809,271).

Hull for aircraft. John M. Miller, New Brunswick, N. J. (1,809,306). Propeller for driving and stabilizing air-

craft. Andrew C. Pereboom, Los Angeles, Calif. (1,809,424). Airship. Matthew M. Egan, Fort Worth,

Airship. Matthew M. Egan, Fort Worth, Tex. (1,809,680).

Wing structure for aircraft and the like. George Miller, Chicago, Ill. (1,809,721). Airfoil. Harry H. Semmes, Chevy Chase, Md., assignor to Bendix Aviation Corp.,

New York, N. Y. (1,809,913). Airplane control. Earl D. Hilburn, Oakland, Calif. (1,809,936).

Landing gear for aeroplanes. Waldemar Miller, New York, N. Y. (1,810,054). Flying machine. Rodrigo M. Smyth, San

Jose, Costa Rica. (1,810,114). Flying machine. John W. Fry, Struthers, Ohio. (1,810,136).

Automatic propeller control. James E. Carol, Los Angeles, Calif. (1,810,159).
Aeroplane. Angel Mateo, Santiago, Do-

minican Republic. (1,810,182).

Airplane. Harold A. Hicks, Detroit,
Mich., assignor to Ford Motor Co., Dear-

born, Mich. (1,810,244).

Appliance for the automatic determination of the range factors for combating air-raft with gurs having two or three averages.

tion of the range factors for combating aircraft with guns having two or three axes and mounted on moving platforms. Leopold Schmidt, The Hague, Netherlands. (1,810,-298).

Parachute, Albert Lehmann, Brooklyn,

Parachute. Albert Lehmann, Brooklyn, N. Y. (1,810,488).

Aviator's helmet. Edmund T. Allen, Seattle, Wash., assignor to Boeing Airplane Co., same place. (1,810,549).

Aeroplane safety landing device. Andrew Bochak, Bobtown, Pa. (1,810,550). Adjustable rotor for aeroplanes and heli-

coptor rotors. Frederick Wander, jr., New York, N. Y. (1,810,584). Aeroplane. Heraclio Alfaro, East Cleve-

land, Ohio. (1,810,693).

Aeroplane. Daniel B. Gish, Worcester,

Mass. (1,810,762).

Aeroplane propeller. Clyde Byer, Marion,

Ind. (1,811,000).

Parachute skirt delater. Edward L. Hoff-man, Dayton, Ohio. (1,811,050).

Expansion device for diagonals and bulkhead wires (of airships). Otto Geisler and George W. Seth, Chicago, Ill. (1,811,122). Steering control for aeroplanes. Arthur

G. Petersen, Brooklyn, N. Y. (1,811,149). Landing gear for aircraft. Alexander Procofieff-Seversky, New York, N. Y. (1,811,-152).

Airship. George D. Hazard, Chicago, Ill. (1,811,196).

Airplane landing brake. Samuel C. Irving, Berkeley, Calif. (1,811,199). Aircraft with rotative wings. Juan de la

Cierva, Madrid, Spain, assignor to Autogiro Co., Philadelphia, Pa. (1,811,303). Airplane. Rene A. A. Couzinet, Paris,

France. (1,811,304).

Control members of an airplane. Rene A.

A. Couzinet, Paris, France. (1,811,305).
 Aircraft landing and releasing apparatus.
 Woldemar Kiwull, Riga, Lativa. (1,811,-

Wind tunnel for testing airplanes. Dimitry E. Olshevsky, Milford, Conn. (1,811,364). Aircraft. Carl B. Harper, Washington,

D. C. (1,811,390).

Airplane propulsion device. Sam R.

Smith, South Bend, Ind. (1,811,441).

Handling carriage for stowing airplanes. Grover Loening, New York, N. Y. (1,811,-510).

Flying boat. Grover Loening, New York, N. Y. (1,811,550).

Handling carriage for airplane bodies. Grover Loening, New York, N. Y. (1,811,-551).

Self-rotating air screw for the aerodynamic brakage of aeroplanes and the like. Giovanni Serragli, Florence, Italy. (1,811,867).

Airplane. Thomas Dugan, Wichita, Kans. (1,812,143).

Retractable landing gear for flying machines. George E. McCrea, San Francisco, Calif. (1,812,211).

Mobile mooring apparatus. Jose A. Garcia, Los Angeles, Calif. (1,812,237).

Pontoon for seaplanes and like bodies.

John Hone, Flin Flon, Manitoba, Canada. (1,812,265).

Detachable floating compartment for agreements. Louis Playies, Paris, France.

aeroplanes. Louis Bleriot, Paris, France. (1,812,317).

Safety propeller. Karl Schapel, North Hollywood, Calif. (1,812,451). Trihydro dirigible and airplane. Van E.

Edwards, Springfield, Ill. (1,812,627). Releasing device for mail bags. Julius L.

Releasing device for mail bags. Julius L de Give, Atlanta, Ga. (1,812,688).

Aeroplane landing gear. George E. F. Hickox, Providence, and William T. Mitchell, Central Falls, R. I. (1,812,698). Device for releasing shells in aircraft.

Per Slinde, Kjeller, Norway. (1,812,759). Aircraft or other brake. Corydon W. Sexton, Fayetteville, N. C. (1,812,806).

Propeller. Willem P. van Lammeren, Voorschoten, Netherlands. (1,812,814).

Propeller spinner for aircraft engines. Ben G. Parsons, Houston, Tex., assignor to Hurricane Motor Co., same place. (1,812,-831) AUGUST, 1931

## PERSONAIRLITIES

THE winter of 1896 had been a hard one on the residents of Steamboat Springs, Routt County, Colorado—a little town some 96 miles from a railroad. The snows had isolated those hardy settlers, the frost had nipped them, the winds had buffeted them, the rains had soaked them. Any tough condition Nature had to hand them, she had passed along, and spared them nothings. Now, however, it was spring, and hope was welling in the heart of Rancher McClelland, a pioneer of those parts. Nature, he concluded, had done her worst to him, and now would give him the boon of warm days and quiet nights.

The warm days arrived in due course, but the quiet nights never materialized, for on this hardy rancher and his wife descended one day in early April, a miniature disaster in the form of a warm, wet, wailing bundle later to be known as Gerald Hunt McClelland-because as soon as he could crawl they had to Hunt for him. Of course, I get this from the local history of those parts, for when Jerry McClelland was born I was farming along the waterfront of Boston, sowing wild oats. This was shortly before the Spanish-American war, which, I understand, was fought practically unassisted by a gentleman named Roosevelt. He afterwards published a history of that war under the title, "Alone in Cuba." But we're getting away from the point.

Jerry Hunt McClelland was more or less educated in various boarding schools in the effete East, under the slightly deluded impression that he would pick up a little Old-World culture. In 1913 he writes me: "Spent the summers herding cattle,' so you can see what progress he made in the higher learning. When Jerry was ten years old his father put him to work during the summer on his ranch, called the Two-Bar, which seems an appropriate start for a pilot. This ranch was one bar ahead of Sam Metzger's. Here Jerry stayed for eight years, building up his constitution,



Gerald Hunt McClelland



and laying the girders for that massive framework which today towers into the skies with all the impressive majesty of Primo Carnera. I'm sorry I haven't a photograph of the complete Jerry McClelland, but after all there are limits to a camera, so we must be content with the head alone. This gives only a slight indication of the rest of the massive structure, which about the middle stories is bulged out in a sort of NACA cowling effect.

However, we're getting slightly ahead of our subject, who on the seventh of April, 1917, exactly 21 years after he had been born, enlisted in the Navy on the very day the United States entered the war that turned out to be so helpful to Uncle Tony Fokker. The rough young rancher was examined and instantly shipped to Massachusetts Institute of Technology at Boston, for polishing. Here he was put through the Ground School and given a Boston accent with which to terrorize the enemy. One of the polishers of those early days was Professor Edward P. Warner, later to rise to the dizzy heights occupied by an Assistant Secretary of the Navy. The Professor wrestled with this rough youth from the great open spaces and in a jiffy had turned him into the cultured gentleman we know today as Mr. McClelland,

Jerry probably entered the Navy with the intention of battling for his country, but apparently the Navy felt that inflicting upon the enemy a warrior of Jerry's undoubted capacity might be classed as an atrocity. Anyhow, they never got cruel enough to send a gladiator like Jerry over -perhaps fearing that he might fall on a few Germans and crush them-so he spent the war very peaceably at Pensacola and Miami as a flight instructor and patrol pilot. Just what he patrolled, I don't know. But if sun-bathing on the roofs of Miami apartment houses was the vogue in those days, I have my own ideas. On the Miami front he fought until March, 1919, leaning on the good old taxpayers until the very last, when he was hurled out into civilian life to shift for himself.

I hate to chronicle what he did in order to survive, for I like to tell only the best about a man. But truth compels me to state that for a year he sold DH 6's and OX-

5's, for which by now he has been practically forgiven. Besides, he must have endured a lot of suffering selling DH 6's, so we should not think too unkindly of him. He worked at this nefarious trade for the United Aircraft Corporation, and later for the Continental Aircraft Co., under Stanley Knauss, general sales manager, who also must have much to answer for. He covered the territory east of the Mississippi to the Atlantic Coast. Nobody in that unfortunate section was safe from Jerry and his DH 6's. In fact, he is solely responsible for the tremendous muscular development of pilots whom he inveigled into wrestling with those DH 6 controls, one of whom afterwards became a bull-dogger, because it was easier to turn a full-grown bull on its back than it was to do a tight spiral in a Sensitive Six.

From 1921 to '23 Jerry barnstormed the middle west, forcing the residents to take to the cyclone cellars, until a kind Providence permitted him to crack up his ship, when the people got some rest. For two years, minus the money to get a new ship, Jerry was a member of the Gorilla Club. He joined at Wichita, Kansas, where a small circus was playing—and as there are today many transport pilots who are members of the Gorilla Club, I may as well tell you how the Club was formed.

Jerry went to the circus manager, said he needed work and would do anything except carry water for the elephants. "Yee only one position open," said the manager. "Our gorilla died last week, and we've dried the hide. If you want to crawl into it and do a gorilla act, I'll hire you." Well, being an air pilot, Jerry needed employment, so he donned the hide, got in a cage, howled, leaped about, and successfully impersonated a gorilla.

Late at night, after he had fallen asleep, the door of his cage clanged open, he wawkened, and found to his consternation that they were shoving a full-grown lion in with him. Horrified, Jerry leaped up and clung to the higher bars of his cage, yelling for help. "Keep quiet," growled the lion. "Do you think you're the only pilot out of a job?" The membership of the Gorilla Club has grown by leaps and bounds.

In 1925 he had made enough as a gorilla to organize the Airport Development Company with another gorilla. Later he joined Coxey's Army, which was taken over complete by the Curtiss-Wright Buying Service. From this magnanimous benefit association he skidded on the first bright day in June, 1930, and shot into the midst of that vast multitude known as the Curtiss-Wright Alumni Association, upon whom manna from Heaven no longer descends.

He is now District Manager of the National Airport Engineering Company, Limited, a division of William E. Arthur, with offices in the Schofield Building, Cleveland, Ohio, where old bills from the gorilla days may find him. He was a recent visitor to my country estate, Cesspool Villa, at Malaria-by-the-Sea, Long Island. What he did to a roast chicken leads me to conclude that even to this day he is earnestly engaged in catching up on the privations of the meals he missed during the old gorilla days. If you're building an airport, don't forget Jerry McClelland. He's an expert on runways, and if he's short a steam roller he simply rolls over and over and packs the material personally.



N December 20, 1900, he was born. On March 28, 1929, he broke the world's solo endurance record: time, thirty-five hours, thirty-three minutes. On June 2, 1929, he broke the world's altitude record for commercial airplanes, gaining an altitude of 26,600 feet. On July 4, 1928, he started on a good-will tour of the United



Martin Jensen

200 cities and towns in forty-two states. On August 16, 1927, he took off from our Pacific Coast and on August 17 he landed in Honolulu, T. H., after flying for twenty-eight hours and sixteen minutes

States, stopping at

over 2,490 miles of the wet Pacific Ocean. Those are the high spots in the life of Martin Jensen. I wrote him for his biography, as he's a member of our National Air Pilots' Association, some of whose life histories I am running at this time. Now, here's a pilot who has had as colorful a life as any in aviation, and whose biography should read like a romance. Yet Martin sits down and gives me three sheets of dates and cold facts! What are you going to do with a fellow like that? Not a word about how he felt on that long hard grind across the Pacific; not a word about how the world looked from five miles high; not a syllable about how he felt flying all alone for thirty-five hours without sleep. It just seems that the fellow who can do those things can't write about them-and the fellow who could write about them can't do them. I, for instance, who to save my life couldn't stay awake thirty-five hours, could write a short novel on how I felt staying awake thirty-five hours, unless I fell asleep writing it. And if I climbed five miles in an airplane I'd at least get an article out of it-and refer to it every now and then to jog your memory. And if I ever got careless enough of my hide to tote it across the Pacific in an airplane, the trip would be good for a serial running ten weeks. But this distressing Jensen who has done all of those things can't say a word more about them than the dates! Martin, you've let me down badly on this biography of yours. I counted on you to do half my month's work for me by handing me a scintillating report of air travel to gladden the six readers of this department. As you haven't done so, I must write it myself. So here I go, Martin, pinch-hitting for you, trying to make a story out of that flock of dates:

"Hello everybody! This is Martin Jensen speaking-thanks largely to a Wright Whirlwind keeping going for twenty-eight hours and sixteen minutes. I've been asked to say a few words on ocean flying in landplanes. Of course the most noticeable fact about that kind of flight is that anyone who makes one usually lets it go at that. You get an odd nut here and there who keeps on asking for something, but most of us simply get out, stretch, and take a boat back. What I say is that anyone can make that kind of flight once and be forgiven for it on the grounds that he didn't know what he was doing; but if he goes again he's not entitled to sympathy, unless he had been dropped on his head by a careless nurse, in which case he shouldn't have entered aviation. He should have run for Congress.

"Paul Schluter, my navigator, and I left Oakland Airport in the Dole air race to Hawaii—and the \$10,000 second prize we won is only a partial solution to the mystery of why we ever left. I'm still trying to figure out the rest of it. Add up the number of moving parts in an engine—and only one engine—add the possibility of oil or gas lines cracking under the vibration; add the possibility of bad weather, magneto failure, spark plug trouble, leaking oil tank and punctures, and the fact that it may be 1,200 miles to the nearest airport—and you still leave me wondering why I left shore. I guess I was born confident.

"Still, there's much to be said for ocean flying on the grounds of what you miss. For example, you don't get crooners on the radio, and you don't get any political speeches. Then you miss the daily newspapers with the latest quotations on New York judges, and the last prohibition scandal. Still, he wet or dry issue is with you, just the same. You're sitting there a dry wondering if you're going to be a wet before the trip is over.

"When we landed in Honolulu, we had about five gallons of gas, enough for only half an hour more—so you see, as we started with 400 gallons and ended with only five, we had a safety margin of one and a quarter per cent. Just imagine how comfortable I would have felt all the way across if I had known that my margin of safety on fuel consumption alone was only one and a quarter per cent. When you add all the other chances, you will see why I'm still wondering why I left shore. If you find out, you might drop me a post card."

Thank you, Martin. Ladies and gentlemen, you have been listening to Martin Jensen, ocean filer, speaking to you over the Caldwell Broadcasting System. This is station CY himself signing off for lunch after

he gives you a few facts about this famous ocean pilot. In 1919 he enlisted in the Navy as an apprentice seaman and was sent to Great Lakes Naval Training Station, where they promptly turned him into an Aviation Mechanic. Here he spent six happy months wiping down the aerial steeds with a rag. When he got them all wined, he was sent to San Diego, California, and attached to the U. S. S. Aroostook in the Tornedo Plane Squadron. He got about forty hours' flying time in the old R-6's, which could barely stagger off the water with a tornedo, aided by a Liberty motor and occasional profanity from the pilot. In 1921 he was discharged as a Second Class Aviation Rigger, and went back to his civil business.

During his spare time he rigged up a Jenny and started flying merely as a sport. but in 1923 organized a flying school for the winter months, and barnstormed during the summer. In February, 1925, he was commissioned an Ensign in the U.S. Naval Reserves at San Diego, and in March, 1925. he was married at Yuma, Arizona, the hottest place I have ever flown over. In June, Martin and his wife left San Diego in an OX-5 Jenny and flew to the New York Air Races and back again. Anyone who could fly from the Pacific to the Atlantic and return in a Jenny would tackle anything. One thing he did was to assemble a Wright I-1 from salvaged parts and mount it in the Jenny. He didn't say where he'd "salvaged" the parts from, but he'd been in the Navy, and was still in the Reserves. In fact, by that time, 1926, he was made Commander of the First Aviation Division, San Diego Naval Reserves. I think I've traced that J-1 down, haven't I, Martin?

Anyhow, in this Jenny with the "salvaged" motor he barnstormed the Rocky Mountains and in January, 1927, went to Honolulu to take charge of some flying in the island, but returned in June to enter that most amazing of all air events, the Dole Race. Nothing like it ever had been seen before-and fortunately never will be seen again. Of fifteen entries, eight started, and two arrived safely. The first arrival, and winner of \$25,000, was Colonel Arthur C. Goebel, and his navigator Lieut, W. V. Davis-later one of the famous Three Sea Hawks. Then came Jensen and Schluter. The reward of all the other entrants was death or disappointment. Jack Frost and Gordon Scott in the Golden Eagle; Auggie Pedlar, Lieut, V. R. Knope and Miss Mildred Doran in the Miss Doran flew to their rendevous with death; "Lone Star Bill" Erwin and Alvin Eichwaldt, starting on August 19, looking for those who had gone ahead, went into a spin and joined them; Lieuts. George W. D. Covell and Richard S. Waggener crashed into Point Loma on a trial flight, and were killed; so was Captain Arthur V. Rogers, also on a test flight. Norman Goddard wrecked his plane on the take-off: so did Major Irving. Neither were injured. (Goddard was killed last year in a glider.) The other entries took off and returned, dropped out, or were barred because of lack of fuel capacity or other causes, Experimental planes, untested planes, navigators who knew nothing of



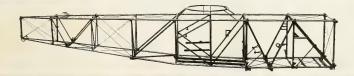
Flawless integrity in the tubing that goes into its construction, down to the smallest member of its framework, is the first requisite of safety in an airplane. All the skill of designers and builders may go for naught if their materials fail them—the rigidity, tautness, and fine balance for which they have provided must all depend on the staunchness of the tubular frame.

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navigation, planes being tested for a flight of 2,500 miles across an ocean—and hadn't flown twenty-five miles across land! What a senseless, brave mess it all was. And the police actually stop people from jumping off Brooklyn Bridge.

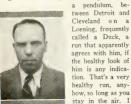
And Martin Jensen was survivor number two of this galaxy of intrepid spirits. Shortly after licking the Pacific the bold Martin loaded a 400-pound lion and 300 gallons of gas aboard a plane at San Diego and started off on a non-stop flight to New York. He never got here. In the mountains east of Phoenix, Arizona, he crashed into Tonto Creek Canyon, lion and all. For three days he was missing; we had practically given up hope, when he appeared afoot at some little wilderness station and startled the world with the announcement that he had trimmed Fate again, and again was a survivor. The lion, he said, was just behind, making slow progress on four sore dogs. I'd give ten dollars to see the look on the faces of Martin and that lion as they crawled out of the wreckage, sat up painfully, and stared at each other; and I'd give twenty more to know what each was thinking.

The amazing thing about these ocean flights is how soon everybody forgets who went where, and when, and why. I hear that someone is working on an invention to count ocean fliers as they disappear from the public consciousness. It's badly needed, as most of us have lost track. As a disappearing act they equal Houdini at his best-ing act they equal Houdini at his best-

And I really think the boys who take the risks of crossing oceans in landplanes should receive larger rewards and greater honors than they usually do. What to give them, though, is a problem comparable only to that one about what to do with used ravy to blades. Now here's a suggestion: Why or blades. Now here's an usgestion is though the them to gather together all these crooning radio tenors, melt them down, and cast them into medals to pin on ocean fliers?



PILOT BYRON C. MOORE has been flying for the past year or more on Transamerican Airlines, division of Thompson Aeronautical Corporation. He's going back and forth, with the regularity of



Byron C. Moore

my life than when I was shoving a Duck—not the Moore Duck, but another one that I later dissected—over that same route in 1929. It certainly

never felt better in

reminded me of old times to fly that route again in April, 1931, two years after Ralph Devore, Lester Bishop, and I had opened it up with the first flights. Moore, Al De Witt, Otis Beard, and George Apitz are first pilots on that run now—or were when I flew over with Captain Beard.

Byron C. Moore, alias Dinty Moore, was born in California thirty-one years ago, and started flying in 1922. I believe he has piled up about 4,000 hours in that time, much of it on airlines. He's a reliable old horse by now, and guaranteed not to shy at passing vehicles. I asked him to send me the sad details about himself for you six readers to weep over; so here they are:

"I tried to get into aviation ground school when I joined the Navy during the war, but did not have the required education. After the armistice was signed I went to the University of Washington for three years, dilly-dallying in aviation from time to time, until I got into Brooks Field in March, 1925. With the help of Lt. Corkill, Gloomy Gus DeWald, Lt. Thorpe, and a few others, I got through Brooks. I had a darn good start at Kelly with the help of Maughn and a few others, but Lt. Moon was finally my Waterloo. To shorten a long, sad story, I was eased out of Kelly in December of 1925.

"Well, after a two months' sojourn in Old Mexico to drown my grief, I finally wound up at my old stamping grounds, Seattle, via Tampico, Mexico, New Orleans, New York, the Panama Canal, and points on the Pacific Coast. I told the late Eddie Hubbard that I was now a 'finished' pilot and told him he ought to do himself a favor by giving me a job. At that time he operated the Seattle-Victoria seaplane mail service to the Oriental boats leaving and arriving at Victoria, B. C., but somehow I couldn't make him graps my point of view.

"Well, sir, I flew around that part of the country for over a year and a half in all the war surplus I could get to hang together, before I could convince Hubbard I was good enough to hire. At that time I was the proud possessor of a C6 Oriole which I acquired through paternal help, and had 'Dinty Moore' pasted on the side of it. When Eddie Hubbard hired me, he had just gone with Boeing as Vice President in charge of Operations of the Chicago-San Francisco line.

"I worked for him until Barnes & Gorst operated on us and removed our mail contract. I then started on a varied career, taking me to Eugene, Oregon, where I flew for Hobi Airways, to New Orleans, La., where I worked for our old friend, Arthur Cambas, carrying the mail down the Mississippi from New Orleans to Pilottown in Curtiss Hisso M F boats and what else have you—old, weatherbeaten and cheap?

"From there I went to Alliance Aircraft Co. as test pilot. While I was there, poor old Aubrey Hess burned up in an Argo that I was supposed to test hop. I had stopped for a few minutes at the front entrance to the factory, and by the time I got around to the rear, poor Aubrey was just taking off

on his last ride. Had I been in the plane, I would not be writing this now.

"A month later, in December, 1929, the factory closed, so I packed my household goods in my Ford and drove to Los Angeles where my old friend, Louis Goldsmith, put me to work Bying Ryans over the Pickwick lines from Los Angeles to San Salvadore. I was sorry to have to leave there on account of Pickwick suspending operations, but Detroit isn't so bad with the Ambassador bridge so handy."

One funny thing about that T. A. C. runin addition to Al De Witt-is that every time vou pass over Walkerville vou see all those breweries and liquor warehouses, and wonder why the ancestors of this present crop of Americans fought like Trojans in 1776 to shake off the rule of an ancestor of the present King of England-who rules the waves and also those breweries and warehouses. Those early American ancestors were so annoved they dumped tea into Boston Harbor, but I'll bet they wouldn't have bothered doing it if they had foreseen that their descendants were going to throw heer over in 1917. Now you see Americans fighting at the Windsor Ferry to get back under British rule again-at least for an occasional evening. Certain good old English customs are very popular with Americans. In fact, I believe the Prince of Wales could come over here, run for King on a wet platform, and he elected.



N 1927 Clifford V. Abbott, nicknamed for some unknown reason "Continuous Victor," was exported from the village of Fremont, Indiana, and shipped to the



Captain C. V. Abbott

Army as raw material, aged in the woods of Indiana for 21 years. The Army Air Corps merely shrugged its shoulders and tossed him into that mill at Kelly Field, which, like the mill of the gods, grinds slowly but exceedingly fine. What

they ground out of this raw material was one Lootenant, complete with wings, and with orders to report at Selfridge Field in February, 1928.

Continuous Victor hardly lived up to his name, so far as the Army was concerned, for in May, 1929, he says himself that he got the roaming fever, resigned from the service, and joined the forces of Transcontinental Air Transport. He has, however, been continuous with them since that date, now holds the rank of Captain—which is one above what he would have got to in the Army by now—and is pushing the Fords from St. Louis to Waynoka, Oklahoma.

# Added PROFITS for



TITH the right ship there is sure profit in short hops. This is being proved daily at airports where Fokker Super-Universal planes are used for feeder lines, sightseeing trips, charter and taxi work.

The Super-Universal is speedy, costs little to operate and thrives on hard use. It has six passenger seats and baggage or lavatory room. Powered by a Pratt & Whitney 420 h.p. "Wasp" engine.

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Each one is in fine mechanical condition and looks like new. They are fully guaranteed by us. The prices have been marked extremely low and, while these planes are available, they are genuine bargains.

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DIVISION OF GENERAL AVIATION CORPORATION

## AIRPORTS FOR SEABOARD CITIES

THE past few years have seen a great many airport terminals constructed and there is competition between cities not only to get the best terminal from an operating standpoint, but to get it built quickly in order to get a fixed place in the field of opera-

Air travel is increasing rapidly, but most of the increase is on long distance flights. Through being personally inconvenienced by failure to get a seat on several different planes, the writer has definite evidence that ships on long flights are frequently fully loaded-but this is not true on short flights. The explanation of this fact is that airplane terminals are located so far from the business sections of the large cities that travel over the comparatively short distances is not practicable. Especially in the Eastern section of the country, airplanes will carry a great many more passengers when terminals are located in the downtown sections of the large cities. This being true, a study should be made as to the possibilities of constructing such

The problem would not be difficult to solve for New York City nor for Philadelphia. Baltimore and Boston, as in all these cities the city governments are building piers for lease,

New York City, however, seems to be the logical place for the first down-town terminal. Here the city might take its cue from the owners of up-town property, who are tearing down twenty-five-story buildings to put up fifty stories, in order that the cost of the building site may be divided between a greater number of stories. Similarly, it does not pay to build one- or two-story piers, neglecting to make use of the air rights.

It would be practical to build struc-

By M. A. Long, A. I. A.

tures for air landing fields over the piers to a height of twelve or fifteen stories, or even higher. The area of three piers, plus the width of the water between these piers, would give an area of 1,200 feet by 1,500 feet. This would be large enough for landing large planes and would give sufficient distance for them to rise. This area over the piers would be far enough removed from the taller buildings to prevent air currents from interfering with the taking off or landing of planes.

These twelve or fifteen stories necessary to make the airports practical should not be a liability. On the contrary, good interest could be earned in rentals, as it should be easy to induce people to move to the river front, where light conditions would be better and rentals more reasonable than might obtain elsewhere. Warehouses or light manufacturing concerns might also be interested in buildings over piers. If this Air Terminal were built over the piers in the Chelsea area, south of 23rd Street, or further down-town, it would be a simple matter to lease this space at a price to earn a good return on the investment. In addition to this income, the city would receive a reasonable revenue from the airlines using the

There are many details of construction that would have to be worked out in connection with this terminal. For instance, the smoke from the steamers that would otherwise collect under the buildings would be collected in a slot and a fan at the end of the pier would draw it out into the open air. The landing field would be practically flat but as water will run from a field which has a rise of one inch to a mile, the installation of a sufficient number of drains would prevent water from collecting.

In order to overcome the effect of snow and ice, it would be necessary to build the runway with a double floor with an air space wherein hot air could be circulated so that the surface would be sufficiently warm to melt snow and ice. The concrete surface should contain a non-slip substance - Carborundum or something similar.

In addition to providing facilities for airplanes, there would be a mast for dirigibles, providing tests demonstrated that the air currents were such as to make mooring dirigibles at a station of this kind practicable.

There are similar locations in Philadelphia, Baltimore and Boston which would be advantageous for landing fields of this character. And it seems definitely indicated that the city which does not develop such an airport is not going to enjoy the interchange of air traffic from cities close by.

#### PROHIBITING OF POWER LINES AT AIRPORTS CONSIDERED

NQUIRIES as to the feasibility of requiring public utilities using wires to install underground lines along the boundaries of approved airports and intermediate landing fields or to construct lines along routes sufficiently distant from these fields to prevent the creation of a hazard to air navigation, have been made of state regulatory commissions by the Airways Division of the Department of Commerce.

In a recent letter to the state commissions, F. C. Hingsburg, Chief Engineer of the Airways Division, calls attention to hazards existing because of pole lines adjacent to several airports. He states that negotiations for the removal of such obstructions have resulted in statements from owners of the lines that permits to build on highways had been granted by state governing bodies and that the cost of removal of the lines would have to be paid by the Government.

Since there is no existing authority to remove such obstructions after the establishment of a field, Mr. Hingsburg requests the advice of the commissions as to whether or not it would be feasible to impose restrictions in the granting of permits, requiring utilities to install power lines which do not constitute obstructions to aerial navigation.



Proposed landing field to make short flight travel more practical

## Setting Entirely New Standards

of Grinding Wheel Duplication -



#### CURRENT AIRPORT AND AIRWAY FACTS

Transcontinental and Western Air Opens First Freight Service in U. S.

THE first strictly freight line in this country was scheduled to go into operation about August 1. The service will be operated by Transcontinental and Western Air, Inc., which company recently established the first mail and express service to cross the country in twenty-four hours.

The air freight service, which for the present will extend from New York to Kansas City, will operate on a separate schedule and will be flown at night. Three Foker trimotored planes are being converted into freight planes for the service. Although the tariffs have not been definitely determined, it is tentatively established that the rates will be one cent a pound for each one hundred miles.

One plane will be flown each way nightly. Intermediate stops will be fixed to serve the principal cities along the route, including Philadelphia, Harrisburg, Pittsburgh, Columbus, Indianapolis, Dayton and St. Louis.

At first no fixed schedule will be maintained, it being planned to hold the plane an hour or so to suit the shipper's convenience. The convenience of the service is expected to appeal to the shipper almost as much as the speed. The 1,100-mile trip will be made in eleven hours or less. American Airways Equips Extensions of

Lines With Radio-Telephone

A MERICAN AIRWAYS, INC., has just contracted for radio-telephone apparatus to equip its four recent extensions. The order, placed with the Western Electric Company, covers equipment for the seven ground stations involved in the extensions. This equipment consists chiefly of 400-watt short-wave radio-telephone transmitters and associated equipment. Planes now in the service of American Airways are already equipped with radio-telephone apparatus.

#### Department of Commerce Increases Staff for Inspection of Airlines

I N order to facilitate the inspection of interstate air passenger lines that have applied to the Department of Commerce for certificates of authority to operate, the Aeronautics Branch has increased its air-line inspection force from three to twelve inspectors and has divided the United States into four districts, each of which will be in charge of an airline inspection crew of three men.

Each crew will consist of two airline inspectors who are expert pilots and qualified to pass on such matters as equipment, personnel and the adequacy of the landing facilities on the routes operated, and an airline maintenance inspector, experienced mit the maintenance of aircraft and equipment. The districts have been designated as Eastern Coast, Northern Central, South Central, and Western Coast.

Sixteen Extensions of Mail Routes Give United States Lead in Air Transport

THE extension of sixteen additional air mail routes throughout the country, which will place the United States far in the lead of any nation in the number of miles flown daily in air transport, has been announced by the Post Office Department. When these extensions become effective, a total of 84.771 miles will be flown each day.

The establishment of these lines is another step taken by the Post Office Department under the terms of the Watres-Mc-Nary Act in the development of passenger service by air.

The sixteen additional extensions authorized are: St. Louis-Memphis, Cheyenne-Denver, Fort Worth-Amarillo, Boston-Portland-Bangor, El Paso-Abbuquerque, Omaha-Sious City-Sious Falls-Watertown; New York-Kansas City; Pueblo-Abbuquerque; Pueblo-Amarillo, Albany-Springfield-Boston, Albany-New York, Albany-Cleveland, Philadelphia-Atlantic City, Washington-Atlantic City, New York-Atlantic City, and Cleveland-Nashville.

#### Low Cost of Building Materials Boosts Improvements at Airports

T AKING advantage of the decline in the price of building materials, airport operators throughout the country are making extensive improvements on their properties. Reports received by the Aeronautical Chamber of Commerce of America, Inc., from nearly 100 cities show that a total of \$2,209,674 is now being expended in airport construction work.

#### Cast Iron Soil Pipe Installed to Drain Airport at Anniston, Alabama

THE Anniston Airport, owned by the United Chambers of Commerce of Anniston, Alabama, recently installed standard cast iron soil pipe, manufactured by twelve of Anniston's industries, to drain the lower end of the airport, which has been considered hazardous on account of the overflow from Choccolocco Creek. The four-inch pipe selected for the laterals will stand a weight of 20,000 pounds. Ten-inch terra cotta pipe was used for the main drain.

#### Heaviest Traffic Over Century Air Lines Carried During Month of June

C ENTURY Air Lines carried 6,206 revenue passengers during the month of June. This represents the company's largest month of passenger traffic to date. Century Air Lines now operates sixty-four daily schedules between its various mid-western terminals.

#### FORESTRY TOWERS AS AIRWAY BEACONS

By R. A. Daugherty

LATELY there has been much interest shown in the application of aeronautic services to forestry through aerial photography, aerial dusting and aerial patrol. The object of this short sketch is to show the reverse—some applications of forestry equipment to aeronautics.

Two years ago the eighty-foot steel Old Town Tower of the Pennsylvania Department of Forests and Waters-located near Clearfield on "Hell's Stretch" of the Chicago-New York transcontinental route of National Air Transportwas converted into a combination fire observation-airway beacon tower. In October, 1928, the tower was illuminated by red lanterns to warn pilots of its presence. These lanterns were not satisfactory and in December, 1928, the tower was illuminated by two floodlights placed near the foot of the tower. However, conditions soon warranted another change, and in May, 1929, the tower was fitted with a beacon light.

In converting the tower to beacon use, the original roof was replaced by a flat metal one and was surmounted by a platform and protective railing. The beacon was of the twenty-four-inch revolving type with six revolutions per minute, giving 2,000,000 candlepower with a 1,000-watt T-20 lamp. The tower was also fitted with two yellow course lights

flashing the characteristic code and designating the nearby intermediate landing field. This was the first tower of its kind in the state to be equipped with an airway beacon; because of its successful operation, plans were made to equip additional towers in the same manner.

The latest fire observation - airway beacon tower is the Pindleton Tower near Pindleton, Indiana Country, Pennsylvania, on the Transcontinental and Western Air route, which was built especially for its dual purpose. This tower is also equipped with a twenty-four-inch revolving beacon and two course lights. No radical changes were made over the original combination tower.

A new tower near Clymer, Indiana County, has been equipped with a beacon platform and would be available at any time as a combination tower.

As an aid in navigating by day, the roofs of the towermen's cabins, which adioin each tower, are painted with standard black and yellow course markings.

The cooperation between the Lighthouse Service of the U. S. Department of Commerce and the Pennsylvania Department of Forests and Waters has resulted in the fire observation-airway beacon tower giving its utmost in utility in that it gives protection to forest land by day and protects and guides the aviator by night.

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## **OUR READERS AIR THEIR VIEWS**

Arthur K. Ransom, seeking information on the question of stolen aircraft, received the following interesting comments from a prominent aircraft insurance man:

We who underwrite aircraft insurance have consistently refused to become alarmed over the question of the theft of planes—at least, for the time being. In fact, we regard as rather distant the time when our prevailing rate of one-fourth per cent for theft insurance will be substantially increased.

Up to this time our group has never been called upon to make a settlement of a claim under theft policies, the few cases of stolen accessories, instruments, etc., having fallen within the deductible limits. At this time, stolen ships are unusual enough to rate first page in almost any metropolitan daily.

We regard the entire situation placidly In the first place, only a handful of people in the country can fly an airplane. In other words, only a very small percentage of the total population is qualified through knowledge and experience to commit such a theft. Furthermore, pilots generally are regarded as good "moral hazards." By that is meant that the average pilot is a high type of man. He has better than average education and intelligence; in many instances he has a fine social background and in many others, affiliations with the military service. He is, by and large, an intelligent citizen with better than average opportunities and little incentive to steal.

Of course, as more people take to the air for pleasure or profit that standard will be lowered but it is unlikely that we shall see much change in the present rates for some time.

Present distressed conditions of business have been expected to increase losses from theft but to date the aircraft field has not had its proportionate share, which would seem to indicate the correctness of our judgment.

## G. B. Hegardt, Port of Oakland manager, sanctions Chamberlin's views on airport postal service and points out an error in fact:

May I offer the following correction regarding postal service at United States airports, which was so ably summed up by Mr. Clarence Chamberlin in the issue of Aero Digest.

"With the exception of United Airport at Burbank, California," wrote Mr. Chamberlin, "no airport has any service aside from mail transfer."

As a matter of fact, however, we are proud that in December, 1928, the Post Office Department established the nation's first commercial airport post office at Oakland Municipal Airport. This post office branch has all domestic postal services, except postal savings—i.e., stamps, money orders, registered letters, C. O. D., parcel

post and general delivery. Its services are enjoyed by the aviation companies located at the field, the 375 persons employed at the airport and the 367 students enrolled here. During the month of May \$335.62 worth of stamps were sold, 44 money orders were issued and 46 registered letters were mailed from the Oakland Airport post office.

The post office is housed in the Administration Building, as are other Federal agencies—U. S. Department of Commerce Aeronautics Branch Eighth District head-quarters, U. S. Department of Commerce Airways Communications service and the U. S. Weather Bureau—located at the field. Boxes for both air mail and regular mail are conveniently located along the line of hangars and collections are made on schedule.

## E. B. Warner, himself a private pilot, is indignant over a reader's idea that privileges of private pilots should be further restricted and proceeds specifically to say so:

I am a private pilot, own my own airplane, and have taken quite a number of people for their first airplane ride. I believe the ideas expressed by Miss Aline Rhonie in your June issue, if put into practice, would do nothing but harm from every point of view.

Let me repeat the suggestion: "No private pilot shall be permitted to carry a passenger or passengers unless in a ship equipped with dual controls, with a transport pilot in charge of one set."

In the first place, the entire suggestion is founded upon a selfish and unreasonable point of view. The proposer assumes that the only lives worth saving are those in airplanes and the only people entitled to protection are the friends or passengers who would be flown by a private pilot. Such people certainly do have a right to expect competent piloting, whether by a private, industrial, limited commercial, or transport pilot. But so do people on the ground, the owners of ground property, other air pilots and airplane owners. If a private pilot is incompetent to fely passengers, he is incompetent to be flying around in an empty plane-

The remedy for air accidents is not to restrict the rights of competent private pilots, but to make it more difficult to become a private pilot and thus produce better pilots, assuming that the present capabilities of the average private pilot are not enough.

Most private pilots own one-, two- or threeplace ships. Assuming a conventional threeplace job, does Miss Rhonie recommend that the transport pilot handle the controls in the passenger compartment, or does she want the transport pilot in the rear cockpit with the private pilot in front, mixed up between the duals and his passenger? If the young lady files at all she ought to know it is against the regulations to do either. It is also against the law to hook up the duals in a two-place ship so a transport pilot could be taken along, and then let the passenger sit on a wing or ride the tail. Perhaps your subscriber is referring to a plane for the private owner such as the Ford fourteen-passenger, Fokker F 32, or the Dornier Do. X.

Considering that over 30,000 people were killed last year by automobiles and thousands of others injured, does Miss Rhonie recommend that all automobiles should be equipped with two sets of controls, one set to be handled by a licensed chauffeur when passengers are carried by an auto driver?

You may as well legislate out of existence the private flier and the privatelyowned airplane if any of the present privileges of flying are to be taken away from the private pilot. The aviation industry is trying to sell more planes, and to create a desire on the part of more people to own and fly their own planes. One way to do that is to build good planes and then try to see that they are flown by good, sane and safe pilots. The Department of Commerce has complete charge of licensing airmen and can make it as hard as they please to get a private or any other kind of license. They have done a good job and should be congratulated. I think the average pilot the Department licenses is competent to fly and that such suggestions as this are injurious to flying, unfair and entirely out of place. I am surprised that your magazine would publish that kind of recommendation.

## Exhibition parachute jumps are deleterious to the industry, Miss Elsie J. Miller believes, and should be eliminated.

I should like to make a suggestion regarding the advancement of aviation for the sake of making the public more confident of the industry, and that is . . the elimination of exhibition parachute jumps.

It seems to me that jumps made purely for the amusement of the people do not give them the impression that the parachute is such a priceless life-saver of the air. Rather, it is becoming a commonplace affair, used more often to entertain crowds than to save a worthy life. In the beginning, parachutes were made for emergency purposes, in the event of a plane's becoming disabled and they are still used for such. But how needless it is to risk one's life any more than is necessary by jumping when there is no cause! Exhibition chute jumps certainly do not belong in the category of enterprises instrumental in furthering the safety of aeronautics.

I have seen dozens of jumps for exhibition purposes, and as I watched them, the thought came to me: How useless it is for anyone to risk his life merely to please and thrill the people below.

In an emergency, a parachute is the safest thing to have, but when leaps are made to provide a thrill, the primary use is forgotten. AUGUST, 1931

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#### STUNT FLYING

79

By Captain R. Duncan

Captain Duncan's new book, recently published, not only tells all there is to tell about stunt flying, but shows the reader also how to make use of the information it gives as a factor of safety. It is a book for the man who already has, or the one who knows that some day he will, 'find his wings.' It is to the the same profit of the same working out your flight Use it an learn profit of the same working out your flight maneuvers on the ground Somsus working out your flight to Fly; Landings; Testing Airplaness Exhibition Flying; Speed and Instrumentis; Amphibians. Cloth binding. 174 pages, 32 illustrations. Price, \$2.30.

#### AIRPLANE WELDING

By J. B. Johnston, M. E.

Between the covers of this timely book is packed every fact and every bit of information available today on the art of welding in aircraft design, construction, and repair. It covers every method of welding—every type of weld—every weldable metal—in plain, everyday language. The author has trained many men in the art of aircraft welding, and is considered everywhere a real authority on the subject. The book is unusually easy to read and understand. Flexible binding, 320 pages, 210 illustrations. Price, \$35.00.

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## THE AIR SERVICES

#### AIR CORPS UNITS RE-DISTRIBUTED

Five-Year Program Will Be Practically Completed at End of the Year

THE general plan for the completion of the five-year program of the Army Air Corps, involving the re-distribution of a number of units and the expansion of the Air Service to new flying fields, was announced July 2 by Major General C. H. Bridges, Adjutant General of the Army. The re-location of the units will bring an increase of the air strength to Hawaii and the Panama Canal Zone.

Twenty-three inactive tactical units will be re-constituted during the next year and a half. The Air Corps will form three new units, demobilize four others and render inactive another three. Lighter-than-air activity will continue to be divided between Scott Field, III., and Langley Field, Va., with two airship companies based at the former post and one at the latter.

The 48th School Squadron will be rendered inactive. The following units will be demobilized: Air Corp's Tactical Detachment; the 10th School Group, the 11th School Group and the 13th School Group

At the end of the year the Air Corps will have approximately forty planes less than the goal of 1,800, according to Major General James E. Fechet, Chief of the Air Corps. The full complement of 14,000 enlisted men will be serving with the Air Corps. The organization may still be short a few officers. The program requires at its completion 1,650 Regular officers and 550 Reserve officers on active duty.

Work is in progress to provide much larger accommodations in Hawaii. Transfers from Continental units will be made between March and June, 1932. Albrook Field, at the Pacific end of the Panama Canal Zone, will be ready about March 15 of next year. Units will be sent to this new field from France Field at the Atlantic end and from Mather and Rockwell Fields in the United States.

The Air Corps units at Mitchel Field, Long Island, will remain practically undisturbed in the redistribution program. From this post, only the 19th Company wing head-quarters will be moved, transfer being effected on March 15 to Albrook Field in the Canal Zone. A new Air Corps field will be developed near Shreveport, La., to which transfers will be made from Fort Crockett. Scott and Brooks Fields. Several units will be established during the winter at Randolph Field, San Antonio, Texas.

#### Embattled No Longer

AIR CORPS Reserve Officers reporting for their annual active duty tour of two weeks at Mitchel Field, L. I., found conditions this year 'vastly improved over those encountered in 1929 and even 1930 when things had taken a decided turn for the better. The one fly in their ointment was a drastic cut in Reserve flying time which limited them to ten hours flying time apiece instead of the anticipated twenty. Lieut. C. B. Allen, who called attention to the unhappy lot of the Air Reserves two years ago through the columns of AENO DIGEST, has been promoted to a captaincy and functioned in the responsible role of flight commander under Major John M. Hayward, head of the 369th Observation Squadron, which is composed of the first group of Reserves called to active duty.

#### General Foulois Is Appointed Chief of the Air Corps

PRESIDENT HOOVER has announced the appointment of Brigadier General Benjamin D. Foulois, Assistant Chief of the Air Corps, to be Chief of the Air Corps with the rank of Major General for a period of four years, succeeding Major General James E. Fechet, whose four-year term expires on December 19.

General Foulois, a native of Connecticut, joined the Army as a private. He became a non-commissioned officer in the engineers and infantry, successively. He was commissioned a second lieutenant in the Signal Corps in 1901. General Foulois was a pioneer in aviation and was Orville Wright's first official passenger. He qualified as Military Aviator in 1912. He is an active pilot in the field whenever possible.

#### New Construction Work to Begin at Lakehurst Naval Air Station

IN PREPARATION for the basing of the new dirigible Ahron at the Lakehurst Naval Air Station, contracts for new constructions at the field were recently awarded by the Bureau of Aeronautics, Navy Department.

New quarters will be erected at a cost of \$327,568. This work, to be completed about April 1, 1932, includes the construction of eight buildings for officers' homes and barracks to accommodate approximately 250 enlisted men.

A contract for the re-erection of a dirigible hangar at the Lakehurst station was awarded at a cost of \$73,000.

#### Coördination Maneuvers Staged by Air Corps in Hawaii

PLANES of the Eighteenth Composite Wing, Hawaiian Department, participated in two-day coordination maneuvers June 25-26. The exercises included a flight from Honolulu to the island of Maui where a simulated attack designed for training in the coordination of the various elements employed was staged. A total of fifty-five pursuit, attack and bombing planes and sixty-three pilots took part in the maneuvers.

On the following day, the fleet made a 100-mile flight from Maui to the island of Oahu in forty minutes, demonstrating a high degree of mobility of organization. The unit flew at an elevation of 8,000 feet with a tail wind of sixty miles per hour.

The maneuvers, held under the super-

vision of Lieut.-Col. G. C. Brant, air officer of the Hawaiian Department, were declared successful in every way and were without untoward incident.

#### NAVAL RESERVE TO HAVE FAST PLANES

Thirty Curtiss Helldiver High-Speed Observation Planes Ordered by Navy AN ORDER for thirty airplanes of the "Helldiver" type for the Naval Aviation Reserves has been placed with the Curtiss Aeroplane & Motor Company, according to a recent announcement of the Bureau of Aeronautics, Navy Department. This contract was reported as the first for aircraft awarded for the new fiscal year. A total of \$443,235.75 was involved in the purchase,

The award of this contract marks the continuation of a Navy program of equipping all Naval Reserve Squadrons with the latest service type aircraft. The Curtiss Aeroplane & Motor Company is at present building thirty-four Helldivers for use by the Naval Reserve which, with the new contract for an additional thirty, will give Reserve squadrons a total of sixty-four planes of this type.

The Curtiss Helldiver is a two-place high-speed observation biplane powered with a Wright R-1340 engine of 450 horsepower. It is designated by the Navy as the O2C-1 his ship is similar in many respects to the Curtiss Navy Fighter FSC-4, employed aboard aircraft carriers in two-seater fighter tactical work, a new phase of Navy aerial warfare introduced in the 1931 Navi maneuters held in Panama

The O2C-1 is in use as an expeditionar observation plane by the Marine Corps East Coast Expeditionary Forces at Quantico, Va., and by the Marine Corps Aviation detachments in Nicaragua.

The O2C-1 is intended to provide the Naval Reserves with ships having maneuverability comparing favorably with those of the fighting squadrons of the aircraft carriers to which many of the Naval Air Reserve officers have been attached during the past four years. It is believed that in this way these officers will be able to maintain their efficiency through continued flying at Naval Reserve bases and that there will be provided training in service type equipment for those who have not served with the Fleet.

The O2C-1 has a fuel capacity of 120 gallons, which is greater than the normal fuel load of previous Navy observation types. The rear cockpit is designed especially for the gunner in any position of when the plane is traveling at high speed.

## CORSAIRS



that wear the
GLOBE AND ANCHOR
of the U.S. Marines

Corsairs in service with the Marine Corps are usually in active service. It may be in Haiti, whose ragged, mountainous interior affords few landing fields that are even possible. It may be over the inaccessible jungles of Central America. It may be in China in sections where plane failure would write "Finis" to an aerial mission.

Corsairs ask no odds of the men who make their assignments, or the men who do the flying. The stamina to stand rough landings and the performance to get into and out of small fields are traditional with this plane. So, too, are its speed—its climb and its excellent handling qualities.

These distinctly Vought characteristics have carried Corsairs through years of strenuous service with the Marine Corps. They have made the Corsair a standard observation plane with the Navy. And they make it an ideal ship for fast executive transport and private flying. Chance Vought Corporation. Division of United Aircraft & Transport Corporation, East Hartford, Connecticut. Export representative: United Aircraft Exports, Inc., 230 Park Avenue, New York, N. Y.



The rear cockpit is equipped for the installation of a standard Navy radio transmitter and receiver for the purpose of furnishing active practice in this type of work. The engines are cowled with the new Curtiss anti-drag ring cowls.

#### Report Summary of Annual Air Corps Maneuvers

NO radical changes will be effected in the organization of the Air Corps as a result of the annual field maneuvers, according to information recently made available. However, many of the problems encountered are undergoing study and recommendations are being made to the various sections concerned.

The following summary of the results, personnel and equipment engaged in the

| naneuvers was reported:                    |          |
|--------------------------------------------|----------|
| Airplanes participating in Exercises       | 667      |
| lenot Transports not moving with Division  | 8        |
| Airplanes moving with Division             | 659      |
| Airplanes damaged beyond economical repair | 3        |
| ilots injured                              | 3 2      |
| assengers injured                          | 0        |
| Tatalities                                 | U        |
| Aircraft (or pliot) nying nours-approxi-   | 38,000   |
| mately                                     | .000,000 |
| Officers                                   | 692      |
| lying Cadets                               | 69       |
| Number of officers and cadets actively en- |          |
| gaged as pilots                            | 720      |
| Enlisted Men                               | 644      |
| livilians                                  | 14       |
| Pursuit                                    | 10       |
| Observation                                | 17       |
| Sombardment                                | 4        |
| Attack                                     | 7        |

Transport .... Consolidated Awarded Navy Contract

CONTRACT for twenty-three patrol planes for aircraft units of the U. S. Fleet was recently awarded by the Navy Department to the Consolidated Aircraft Company, Buffalo, N. Y. A total of \$1,709,837.50 was involved in the purchase. Delivery of the first plane is scheduled by March 1, 1932, and the remainder by August 1, 1932.

The Wright Aeronautical Corporation, Paterson, N. J., has been awarded a contract for sixty-nine engines for use in the Consolidated patrol planes. Total cost is \$523,-506.85.

Navy Buys Two More Autogiros EXPERIMENTAL work with autogiros will be continued by the Navy Department and two craft in addition to the one previously acquired were recently purchased, according to a recent announcement of the Department. Contracts for the two new

autogiros was recently awarded to Pitcairn Aircraft, Inc., Willow Grove, Pa., at a total cost of \$44,076.

The Bureau of Aeronautics has purchased these planes in order to test their possibilities for naval observation purposes. Experiments with an autogiro equipped with pontoons for seaplane use, as well as normal landing gear for aircraft carrier operation, are contemplated. Preliminary trials with the first autogiro are now under way.

#### NORTON FIELD NOTES

[W. DONALD WALTER]

Air Corps Reserve Flying THE busiest week-end in the history of Norton Field was that of June 20-21. On those two days, nineteen Air Corps Reserve pilots flew a total of seventy-five hours and twenty-five minutes. Lieutenant McConnell is suspected of pestering the engineering department at Fairfield until they finally gave him airplanes just to get rid of him; at any rate, when the first officers arrived at the field at noon on Saturday they found seven ships on the line ready to go and three of them service types. There were three O2H's, three PT1's, and one PT3. From then on the ships were in the air constantly.

Most of the pilots had been checked out on the O2's, and practically all the remainder received their check hops on Saturday. The first arrivals got the O2's, and late-comers had to be satisfied with the training types until their turns at the service types came around. Some excellent formations were flown in both types of planes. Among the out-of-town pilots reporting for the week-end were Majors Tabor, from West Virginia, and Zimmerman from Mansfield: Captains Cahill from Cleveland, Cotner from Van Wert, Robinson from Springfield, Sloan from Canton; and Lieutenants Carlson and Rumage from Cleveland, Juergensmeier from Logan, Keelor from Lebanon, and Rose from Lima

LOCAL members of the Air Corps Reserve are considerably concerned over the action to be taken by the War Department when the present lease on Norton Field expires next year. A movement is under way to obtain the rental of the municipal hangar at Port Columbus for the use of the

Reserves. Major William F. Centner, C.O. of the 308th Observation Squadron, Air Corps Reserve, and superintendent of Port Columbus, states that removal of the Army base from the city will mean that Columbus will suffer a considerable financial loss, due to the elimination of the payroll and of purchases made in the city for the field. Considered of far more importance, however, would be the loss to the national defense of approximately sixty trained Air Corps Reserve officers, who would have no facilities for keeping in training and whose services would consequently be of little assistance to the country in event of an emergency. It is hoped that the War Department will see fit not only to continue the Reserve base here, but to encourage Reserve activities by constantly increasing the number of available airplanes and the flying time allotted.

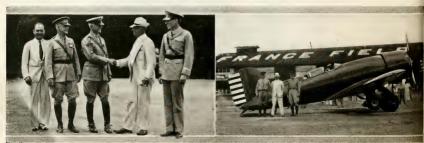
TWELVE Model O3U-1's, most recent modification of the Vought "Corsair" series, have been delivered by the Chance Vought Corporation under current Navy contracts, according to a recent announcement of Chance Vought officials. Fly-away deliveries were made at the Chance Vought factory, Hartford, Conn., the planes being flown by Navy personnel to Hampton Roads, Va. for use with Aircraft Squadrons, Scouting

Three additional ships of this model were recently flown to the Naval Air Station, Anacostia, D. C., for use by that station.

#### Deliver First Ten of 135 Boeing Pursuits

THE first ten P-12E Wasp-powered pursuit planes on the Boeing Airplane Company's contract with the Army Air Corps for 135 airplanes of this type, were completed during July. According to the delivery schedule, fifteen P-12E's will be finished each month until the completion of the order. The construction of the P-12E pursuit planes marks the first quantity production of standard fighting planes with allmetal monocoque fuselages, the Boeing Company announced.

AN ORDER for 200 Switlik Safety Chutes has been issued to the Switlik Parachute & Equipment Company of Trenton, N. J., by the Navy Department.



(U. S. Army Air Corps Pho



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#### U. S. ENTRY IN WORLD SOARING CONTEST

AERO DIGEST Sponsors Participation by Jack O'Meara in International Meet at Wasserkuppe

AS a proponent of aviation development generally and as an expression of its interest in motorless flight, AERO DIGEST with The Sportsman Filol is sponsoring an American entry in the International Soaring Contest this summer at Wasserkuppe, near Frankfort, Germany. Jack O'Meara, holder of the American endurance record of six hours and forty-eight minutes, will represent the United States.

This will be the first time this country has participated in these contests since they began several years ago.

He will compete against more than forty entries from more than ten countries, including France, England, Germany, Austria, Switzerland and Sweden and will be the only American in the meet. O'Meara plans to return to this country on September 8 to make a series of inter-city glider flights in preparation for a free glider flight across the continent.

Accompanied by Augustus Post, one of America's pioneer balloonists and pilots, O'Meara sailed for Germany last month on the S. S. Europa. Mr. Post, in addition to managing O'Meara's trip, expects to obtain meterological data important to gliding and information on methods and equipment used in glider training.

#### NAVY BALLOON WINS NATIONAL RACE

THE Navy entrants Lieut. T. G. W. Besttle and his aide, Lieut. Wilfred Bushnell, on July 20 won the National Elimination Balloon Race for the Litchfeld Trophy with a twelve-hour flight of 215 miles from Akron, Ohio, to Marilla, N. Y. They covered twenty-five miles more than Frank Trotter and Roland Blair, who placed second in their Goodyear-Zeppelin No. 8 with a flight to Stevensville, Ont. Tumultuous weather was flown through by the contestants.

These two crews qualify to represent the United States in the International Gordon Bennett Balloon Race with Ward T. Van Orman who won the international event last year. The Gordon Bennett race this year is scheduled to start from Cleveland, Ohio, on Labor Day.

The national balloon race of 1931 was one of the most turbulent in the history of this event. Lightning, thunder and rain was encountered practically from the start. The winning distance was approximately one-half of that of 542 miles made by Van Orman in the Bennett Race of 1930. Lieutenant Settle won the climina-

tion race in 1929 and Blair and Trotter

Third place went to the entry of radio station WJR, Detroit, with E. J. Hill, international winner in 1927, as pilot, and Arthur Schlosser as aide. They landed near Eric, Pa., a distance of 110 miles. None of the other entries lasted the night through. The United States Army No. 2 and the Del-Mar-Va of the Eastern Shore Association failed to get outside of Ohio and the United States Army No. 1 reached Custard, Pa.

This year's race was limited to eight balloons, each of 80,000-cubic-foot capacity and inflated with natural gas.

The Navy has participated in the National Balloon Races since 1919 with the exception of 1924-25-26.

#### Consolidate Northrop and Stearman Aircraft Companies

P LANS for the consolidation of the Northrop Aircraft Corporation of Burbank, Calift, and the Stearman Aircraft Company of Wichita, Kan, were announced on July 23 by F. B. Rentschler, president of United Aircraft & Transport Corporation, of which both companies are subsidiaries.

On or about September 1, all of the assets and the engineering personnel of the Northrop organization will be transferred to Wichita and the Steaman Company will proceed with production and will be prepared to service the Northrop ships delivered to date.



(Aeme photo

Navy entry taking off from Akron, Ohio

Stearman, a pioneer company, manufactures commercial types of airplanes and recently completed the installation of new manufacturing facilities. Northrop has been a development company and two types have been developed and are ready for production—the Alpha, a high-speed all-metal light transport, and the Beta, an all-metal ype of construction. In addition, Northrop engineers have made progress in the development of the "all-metal flying wing."

#### NATIONAL AIR RACE

Final Preparations Being Completed at Cleveland—Airport Regulations for Pilots Announced.

HE National Air Race of 1931, the eleventh of this annual American aviation classic, will be held at the Cleveland Airport, Cleveland, Ohio, August 29 to September 7. The air race program with the schedule of competitive events and prizes for contest winners has been compiled. The airport rules and regulations effective during the races have been prepared and approved by the Department of Commerce. Construction of the new grandstand and race course has been practically completed for the accommodation of visiting and competing pilots and planes and thousands of spectators

The races were run at Cleveland in 1929 and at Chicago last year.

The new Cleveland air race course is one of ten miles. It is kite-shaped with the large end of the kite described by three pylons at the northern end of the grandstand. The home pylon, forming the eastern axis of the kite, will be 800 feet out from the center line of the stands and administration building. The narrow end of the kite will be south of the stands. Spectators may keep racing planes in sight over three-fifths of the entire course as they come in from the south and make a sweeping turn in a counter-clockwise direction around the home pylon.

The race program includes forty-two closed course events, twelve special speed dashes, two handicap derbies from the Pacific Coast to Cleveland and a free-for-all mixed derby.

Considered of especial interest is the Thompson Trophy Race, a free-for-all speed race for landplanes over ten laps of a ten-mile course, carrying a purse of \$15,000 and the Trophy. This race was first held last year over a course with five-mile laps. Similar to the Thompson race and open to women pilots only, is the Cleveland Pneumatic Aerol Trophy Race with a purse of \$7,500. Entrants must make a minimum speed of 140 miles per hour to qualify.

Among the well-known pilots expected to compete in the race events are Major James Doolittle, Lieut. Alford Williams, Wiley Post, Doug Davis, Lee Shoenhair and Capt. Frank Hawks. Lieutenant Williams recently returned from Europe where he obtained entries in the races of several prominent Continental pilots, including Ernst Udet of Germany and Lieut. Richard Atcherley of England.

Among the officials of the National Air Races are the following: Col. Edward Rickenbacker, referee; Major. E. H. Zistell, chief judge; E. W. "Pop" Cleveland, race contest chairman; Ray Collins, chief starter; Carl Schory, chief timer; F. Burnside, chief scorer; Capt. O. Richardson, head of technical committee; W. C. Whitehead, in charge of field, course and supply; and Ray Brown, chief of operations.

Clifford W. Henderson is managing director of the races and Clifford Gildersleeve is executive vice-president.

#### Instructions to Pilots

The rules and regulations for pilots using the Cleveland Airport during the National Air Races were recently announced

by the management as follows: Dy the management as follows:

The field will be divided by a white line, the portion east of the line to be for airline traffic and such operations as do not concern the consective of the line will be considered to the consecutive of the co

and such operations as do not concern the context department. West of the line will all adeal exclusively for our been at side of the white line and taxi to a position on the field marked "For Visiting Shaps."

It is not a position on the field marked "For Visiting Shaps."

It is not been at a position of the field marked "For Visiting Shaps."

It is proposed to graph the part of the field marked "Contesting airplanes upon that part of the field marked "Contest" where instructions will be issued relative to parking airplanes. It is proposed to give he will content that the proposed to give he will content the proposed to give he will confine their states of the content of the proposed to give he will be instructed as to the location of that space which he will hold. "Visiting airplanes and pilots will confine their ske-off; and landings to the cast side of the cast side of the content of the proposed to the content of the proposed to the state of the content of the proposed to the content of the content of the content of the proposed to the content of the content

Pratt & Whitney Announces New Super-charged Hornet Engine

DEVELOPMENT of a new high-compression, supercharged Hornet, a radial air-cooled aircraft powerplant capable of developing 775 horsepower at sea level, has been announced by Andrew Willgoos, chief engineer of the Pratt & Whitney Aircraft Company. This engine, a modification of the standard Series B Hornet, will carry its former rated power of 575 horsepower up to an altitude of 8,000 feet

The supercharged Hornet was designed primarily for military bombing planes and recently completed satisfactory type tests at the Naval Aircraft Factory.

The improved performance is obtained through supercharging and higher compression ratios. The new engine is equipped with an improved type of supercharger drive which makes possible higher supercharging than could be efficiently obtained previously. The powerplant incorporates a propeller reduction gear of novel design, having 3 to 2 ratio. The same design features which have been tested in the various Pratt & Whitney engines have been incorporated in the new Hornet, coupled with improvements tested by hundreds of hours of full-throttle testing.

#### Dr. Brock and Col. Garrett Making Air Tour of Forty-eight States

GOOD-WILL air tour of the United A States is being made by Dr. J. D. Brock and Col. Ruby D. Garrett, visiting the governors of the forty-eight states and promoting public interest in flying and the establishment of airports. As official representatives of Greater Kansas City and the States of Missouri and Kansas, they will fly over more than 17,-000 miles. The trip will require a total of twenty-five flying days without allowing for inclement weather.

The tour has been divided into four stages. The first flight, which carried them through eleven states in the Middle West and South, started from Kansas City on June 29 and was completed on July 4. The second flight began at Kansas City on July 13 to follow a route through the Mid-South, Southeast, along the Atlantic Seaboard to New England and Canada, thence from Buffalo, N. Y., through Ohio, Michigan, Indiana, Illinois, Wisconsin, Minnesota and Iowa.

Dr. Brock had completed his 591st consecutive daily flight when the tour began.

#### Aviation Country Clubs Holds First Annual Seaplane Cruise

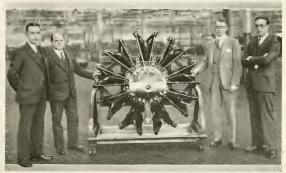
FIFTEEN water-flying aircraft carrying forty passengers and pilots participated last month in the first annual Aviation Country Clubs Invitation Seaplane Cruise, sponsored by the Amateur Air Pilots Association. Starting at Oyster Bay, L. I., July 10, the armada made a four-day tour of coast resorts on Long Island and in Southern New England, completing the cruise July 13 at Montauk,

The purpose of the cruise was to provide a background for an annual gathering of amateur owners of water-flying equipment, similar in spirit to the race weeks and regattas of yachting clubs. Participation was limited to private owners of aircraft who are members of Aviation Country Clubs or of vacht clubs.

The schedule was arranged to permit a number of short flights, stopping at yacht clubs and summer places for lunch, overnight or refueling and to allow ample time for participating in summer sports.

THE United States Civil Service Commission announces open competitive examinations for associate engineer and assistant engineer.

Applications for the positions of associate engineer (optional branches-aerial navigation, aeronautical, construction, heating and ventilating, and telephone and telegraph engineering) and assistant engineer (optional branches-heating and ventilating, and construction engineering) must be on file with the United States Civil Service Commission, Washington, D. C. not later than August 21, 1931.



New type P & W Hornet; (left to right) D. L. Brown, president; A. Willgoos, chief engineer; B. Gilpin, factory manager; C. W. Deeds, vice president

Total

Value (1)

No.

#### VALUE OF AIR PRODUCTS IN 1930

A IRCRAFT, engines and equipment valued at \$61,211,197 were produced for both civil and military purposes during the calendar year 1930, according to a survey recently completed by the Aeronautics Pranch of the Department of Commerce.

Aircraft manufactured during 1930 included 3,437 airplanes, of which 1,078 were monoplanes and 2,359 biplanes. Parts valued at \$7,211,992 for airplanes were manufactured. The total value of parts and heavier-than-air aircraft, exclusive of engines, was \$34,545,728. Eleven airships and balloons were produced and the total value of lighter-than-air aircraft and parts, exclusive of engines was \$365,021.

During 1930, 4,356 engines were manufactured, valued at \$17,267,793, while engine parts produced during this period were priced at \$5,128,261—a total of \$22,396,054.

Aircraft equipment valued at \$3,904,394 was manufactured. This included 236 sets of pontoons valued at \$1,029,060, 8,032 propellers valued at \$1,808,462, and 3,818 parachutes costing \$1,066,872.

## LICENSED AIRCRAFT AND PILOTS INCREASE

THERE has been a steady increase since of aircraft, pilots and mechanics holding active Department of Commerce licenses, according to the results of a study recently completed by the Aeronautics Branch. At the end of the second quarter on July 1, a total of 7,458 aircraft, 16,268 pilots and 9,222 mechanics held Government licenses. This is in comparison with January 1 of this year when there were 7,554 licensed aircraft, 15,280 licensed pilots and 8,993 licensed mechanics.

The total number of aircraft, licensed and unlicensed, of which the Branch had record on July 1, was 10,235, as compared with 9,818 on January 1, 1931. Unlicensed craft (bearing identification numbers only) numbered 2,777 on the first of July, as against 2,464 on the first of January.

Leading the states in number of aircraft, licensed and unlicensed, was New York, with 1,190. California was second with 1,160 and Illinois third with 685. Considering licensed aircraft only, California led with 974; New York with 965 was second, and Illinois was third with 472. The greatest number of unlicensed aircraft was in New York, where there were 225, while Illinois had the next greatest number, 213, and California was third with 186.

In number of licensed pilots, California led with 3,092, New York was second with 1,658 and Illinois third with 1,031. California also led in number of licensed mechanics with 1,674; followed by New York with 883, and with Illinois' total of 561 third.

Among the 16,268 pilots' licenses that were issued as of July 1, there were 6,532 transport, 1,741 limited commercial, 67 industrial and 7,928 private. The licensed pilots in-

cluded 445 women, whose licenses were divided as follows: Transport, 34; limited commercial, 53; industrial, two; private, 356. The 9,222 mechanics included five women.

The number of licensed gliders was 100, and unlicensed gliders, 1,107, a total of 1,207. Licensed glider pilots numbered 238. The greatest number of gliders in a single state was in California, where there were 257. Michigan was second with 121 and New York third with 119. California also led in number of licensed glider pilots with 98, while New York had 36 and Michigan 24, while New York had 36 and Michigan 24.

HEAVIER-THAN-AIR (Excluding Powerplants)

Type

Open cockpit, one, two, three,

discontinuance of operations.

(3) Manufactured for experimental purposes. No value given.

etc., place .....

Cabin, single engine

A NEW uniform color combination, consisting of maroon, orange, black and aluminum has been adopted for all airplanes of the Aeronautics Branch of the Department of Commerce.

The tops of the wings on monoplanes, the tops of upper wings on biplanes, and the upper surface of elevators and stabilizers, will be painted international orange. The metal cowling on the front part of the airplanes and the wheel fairings are to be maroon, and the landing gear and under struts will be black. The fuselage of all planes and the lower wings on biplanes will be aluminum.

Biplanes

Value (1)

\$945,982 1,971 \$13,368,461 2,251 \$14,314,443

No.

## NUMBER AND VALUE OF AIRCRAFT, AIRCRAFT ENGINES AND AIRCRAFT EQUIPMENT MANUFACTURED DURING THE CALENDER YEAR 1930

Compiled by the Aeronautics Branch, Department of Commerce

AIRCRAFT

Value (1)

Monoplanes

| One to three place. Four or more place. Cabin, Multi-engined. Amphibions Seaplanes, all types. Autogiros Miscellaneous (2) Totals                                                                                                                                                                                                                                  | 136<br>444<br>60<br>25<br>17<br>2<br>114<br>1,078 | 367,271<br>3,067,766<br>2,046,325<br>386,231<br>935,050<br>23,400<br>171,000<br>\$7,943,025 | 20<br>21<br>85<br>62<br>200<br>2,359 | 279,486<br>1,109,619<br>1,734,898<br>2,498,247<br>400,000<br>\$19,390,711 | 136<br>464<br>81<br>110<br>79<br>2<br>314 | 367,271<br>3,347,252<br>3,155,944<br>2,121,129<br>3,433,297<br>23,400<br>571,000<br>\$27,333,736 |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------|---------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------------------|-------------------------------------------|--------------------------------------------------------------------------------------------------|
| Parts—Airplane                                                                                                                                                                                                                                                                                                                                                     |                                                   |                                                                                             | ,                                    | . , ,                                                                     |                                           | 7,211,992<br>\$34,545,728                                                                        |
| LIGHTER-THAN-AIR (Excluding                                                                                                                                                                                                                                                                                                                                        | ng Pow                                            | rerplants)                                                                                  |                                      |                                                                           |                                           |                                                                                                  |
| Airships                                                                                                                                                                                                                                                                                                                                                           |                                                   |                                                                                             |                                      |                                                                           | 2                                         | \$74,604                                                                                         |
| Balloons Captive Free                                                                                                                                                                                                                                                                                                                                              |                                                   |                                                                                             |                                      |                                                                           | 6                                         | 31,560<br>12,355                                                                                 |
| Total                                                                                                                                                                                                                                                                                                                                                              |                                                   |                                                                                             |                                      |                                                                           | 11                                        | \$118,519<br>246,502<br>\$365,021                                                                |
|                                                                                                                                                                                                                                                                                                                                                                    | EI                                                | NGINES                                                                                      |                                      |                                                                           |                                           |                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                    |                                                   | Radial                                                                                      | All (                                | Other Types                                                               |                                           | Total                                                                                            |
|                                                                                                                                                                                                                                                                                                                                                                    | No.                                               | Value                                                                                       | No.                                  | Value                                                                     | No.                                       | Value                                                                                            |
| Engines (aircraft only) 100 h.p. or less 101 to 200 h.p 201 to 400 h.p Over 400 h.p                                                                                                                                                                                                                                                                                | 490<br>703<br>647<br>1,836                        | \$385,295<br>1,432,325<br>2,159,705<br>10,166,92                                            | 5 35                                 | \$250,250<br>63,800<br>(3)<br>2,809,496                                   | 773<br>738<br>640<br>2,196                | \$635,545<br>1,496,125<br>2,159,705<br>12,876,418                                                |
| Totals                                                                                                                                                                                                                                                                                                                                                             | 3,676                                             | \$14,144,247                                                                                | 7 680                                | \$3,123,546                                                               | 4,356                                     | \$17,267,793                                                                                     |
| Parts—engine<br>Total value of engines and parts                                                                                                                                                                                                                                                                                                                   |                                                   |                                                                                             |                                      |                                                                           |                                           | 5,128,261<br>\$22,396,054                                                                        |
|                                                                                                                                                                                                                                                                                                                                                                    | EQU                                               | UIPMENT                                                                                     |                                      |                                                                           |                                           |                                                                                                  |
|                                                                                                                                                                                                                                                                                                                                                                    |                                                   |                                                                                             |                                      |                                                                           | No.                                       | Value                                                                                            |
| Pontoons (sets) Propellers Parachutes                                                                                                                                                                                                                                                                                                                              |                                                   |                                                                                             |                                      |                                                                           | 236<br>8,032<br>3,818                     | \$1,029,060<br>1,808,462<br>1,066,872                                                            |
| Total value of equipment                                                                                                                                                                                                                                                                                                                                           |                                                   |                                                                                             |                                      |                                                                           |                                           | \$3,904,394                                                                                      |
| Grand Total-Aircraft, Engines, P                                                                                                                                                                                                                                                                                                                                   | arts an                                           | d Equipmen                                                                                  | ıt                                   |                                                                           |                                           | \$61,211,197                                                                                     |
| (1) Includes value of aircraft with instruments and accessories but does not include powerplant.  (2) Includes planes and estimated value of planes constructed by individuals or concerns (not considered as aircraft manufacturers) for their own or experimental use and those manufactured by aircraft companies failing to send in a production report due to |                                                   |                                                                                             |                                      |                                                                           |                                           |                                                                                                  |

#### OF RECENT EVENTS DIGEST

A Brief Chronological Summary of the Month's Important Aeronautical News

Channel Glider Flight

(England.) Robert Kronfeld, Austrian, won the prize of \$5,000 offered by the London Daily Mail for the first round-trip flight in a glider across the English Channel. He flew from a field near Calais, France, to Sevingate, England, landed and later took off on the return flight. (June 20.)

#### Cross-Country Autogiro

The first eastward transcontinental flight in an autogiro and the first round trip across the United States from coast to coast in an autogiro were completed at Newark Airport, N. J., by Mrs. Amelia Earhart Putnam. (June 22.)

Air Corps in Hawaii

Sixty-three pilots and fifty-five planes of the Eighteenth Composite Wing, U. S. Army Air Corps, participated in a two-day coördination maneuver included in a program of developing the aerial defense of Hawaii. (June 24-25.)

U. S.-Denmark Flight

(Denmark.) Flying the Bellanca monoplane Liberty, Otto Hillig and Holger Hoiriis landed at Copenhagen, completing a flight from Hasbrouck Heights, N. J., via St. John's and Harbor Grace, Newfoundland, and Krefeld and Bremen, Germany. On the flight, which began June 19, they crossed the Atlantic from Harbor Grace to Krefeld in approximately thirty-two hours. (June 26.)

R. A. F. Display

(England.) Featuring new types of service and civilian aircraft and new military aerial formations, the annual display of the Royal Air Force was held at Hendon Aerodrome, attended by more than 175,000 spectators. (June 27.)

The Third Annual Michigan Air Tour ended at Grand Rapids, Mich., after a tour of the state which began on June 18. (June 27.)

New Distance Record

(Russia.) Mme. Maryse Bastie, French pilot, completed at Prino, near Nijni Novgorod, a straight-line flight of 1,810 miles from Paris, a new world record for light planes. (June 30.)

Graf Zeppelin

(Germany.) The airship Graf Zeppelin, in command of Dr. Hugo Eckener, left Friedrichshafen for a cruise to Iceland in preparation for a projected flight to the Arctic some time this year. (June 30.)

#### Model Plane Meet

The annual meet of the Airplane Model League of America was held at Dayton, Ohio, (June 30-July 1.)

Trans-Canada Air Pageant

(Canada.) Participating planes and pilots in the Trans-Canada Air Pageant from coast to coast took off at Hamilton, Ont., on a tour to Vancouver and return. (July 1.)

World Flight

Wiley Post and Harold Gatty in the Lockheed Vega Winnie Mae completed a world flight around the Northern Hemisphere from New York to New York. They covered a total distance of 15,474 miles in a total elapsed time of eight days, fifteen hours and fifty-one minutes, or a flying time of four days and ten hours. (July 1.)

Air Corps Program

The general plan for the completion of the U. S. Army Air Corps program, involving the re-distribution of a number of units and the expansion of the services to new flying fields, was announced by Major General C. H. Bridges, Adjutant General of the Army (July 2.)

Sixteen new air mail routes were announced by the U. S. Post Office Department. (July 2.)

National Air Tour

The National Air Tour of 1931, seventh annual competition for the Edsel B. Ford Reliability Trophy, started at Detroit, Mich. (July 4.)

Begin Good-Will Tour

An air tour of the Middle West and South was completed at Kansas City by Dr. John D. Brock and Col. Ruby D. Garrett, The tour was the first of four which, when completed, will have visited the capitals of the forty-eight states. (July 4.)

Seaplane Cruise

Fifteen water-flying aircraft carrying forty passengers and pilots participated in the first annual Aviation Country Clubs Invitation Seaplane Cruise. The armada made a four-day cruise of Long Island and Southern New England coast resorts, finishing at Montauk, L. I. (July 10-13.)

Brock-Garrett Tour

The second phase of a nation-wide goodwill air tour, visiting states on the Atlantic Seaboard, the North Central section and Canada, was started at Kansas City by Dr. Brock and Colonel Garrett. (July 13.)

Night Air Passengers

The first night air passenger service between Newark, N. J., and Chicago, Ill., was inaugurated at Newark Airport by National Air Transport. (July 15.)

U. S.-Hungary Flight (Hungary). The first flight from North America to Hungary was completed in the Lockheed Sirius monoplane Justice for Hungary by Capt. George Endres and Capt. Alexander Magyar, Hungarian army reserve officers. The flight was made from Roosevelt Field via Harbor Grace, Newfoundland, the plane being forced down for lack of fuel near Budapest. It required twenty-six hours and twelve minutes for the Newfoundland-Hungary leg of the flight. (July 16.)

Italian Air Tour

(Italy.) Thirty-seven pilots took off from Rome on a ten-day competitive air tour over a 6,060-mile route around Italy, (July 17.)

Hall's Havana Flight

(Cuba.) A flight of eight hours and thirty-five minutes elapsed time from New York to Havana was completed in a Lockheed Altair by James G. Hall, exceeding by forty-six minutes the record of Capt. Frank Hawks. (July 18.)

Hall's Return Flight

James G. Hall flew from Havana to New York in eight hours and fifty-one minutes, including a stop at Miami for refueling, seven minutes more than the record established by Capt. Frank M. Hawks. (July 20.)

National Balloon Race

Lieuts, T. G. W. Settle and W. Bushnell flew their Navy balloon 215 miles from Akron, Ohio, to Marilla, N. Y., winning the National Elimination Balloon Race for the Litchfield Trophy. Frank Trotter and Roland Blair placed second with a 190-mile flight to Stevensville, Ont. (July 19-20.)

Coast-to-Coast Air Mail

The first of the new twenty-four-hour transcontinental mail planes of Transcontinental and Western Air left Newark Airport for Los Angeles, carrying 1,000 pounds of air mail. (July 20.)

London Air "Raids"

(England.) To test London's air defense, the Royal Air Force began a week of air maneuvers over the city. (July 20,)

New York-Montreal Flight

A round-trip flight from New York to Montreal was completed in three hours and thirty-four minutes by James G. Hall, a new record. Carrying a passenger on the northbound trip, he established a record of one hour and fifty-seven minutes. Hall completed the return flight in one hour and fifty-seven minutes, twelve minutes more than the record held by Capt. Frank M. Hawks. (July 22.)

Hawk's New Record

A round-trip flight from New York to Havana, Cuba, was completed by Capt. Frank M. Hawks in seventeen hours, two minutes and fifty seconds, setting new records in both directions. He flew from Floyd Bennett Field to Curtiss Airport, Havana, in eight hours, eight and one-half minutes, and returned in seven hours and thirty-one minutes. (July 23.)

#### N. A. A. Convention

The annual convention of the National Aeronautic Association was held at Washington, D. C. (July 23-24.)

#### Sets Glider Mark

(Hawaii.) A new unofficial record for sustained motorless flight was established at Honolulu by Lieut. J. C. Crain, U. S. Army Air Corps, who remained aloft for sixteen hours and thirty-eight minutes, surpassing the mark of fifteen hours and nine minutes set July 19 by Hawley Bowlus at Point Loma, Calif. (July 26.)

#### Graf Flys to Arctic

Russia.) Carrying Russian, German and American scientists, the *Graf Zeppelin* took off from Leningrad for a six-day voyage of exploration and scientific study in the Far North. (July 26.)

#### Plan Group of Flying Clubs

THE first flying club in conjunction with the Jarman Shoe Company, Nashville, Tenn., has been organized at Nashville

During the past six months in various sections of the country, free ground school courses were inaugurated by the company and attended by groups of young men ranging in age from fourteen to twenty-five.

It is the intention of the company to organize approximately 500 similar flying clubs throughout the country.

THE GOODVEAR-ZEPPELIN COR-PORATION, Akron, Ohio, has practically completed the construction of the Navy airship ZRS-4, according to a recent announcement of company officials. The airship is to be christened the Akron by Mrs. Herbert Hoover in ceremonies at the airship hangar on August 8. Trial flights are scheduled to begin some time after August 15, with a Navy crew and under the supervision of a Naval board of inspection and survey. During these trials, at least seventy-five hours of flying will be carried out in a minimum of five separate flights.

The company also has under construction at Akron a second airship for the Navy, the ZRS-5, similar to the airship which will be tested this month.

#### COMING AERONAUTICAL EVENTS

July 28-August 10. International Soaring Meet, Wasserkuppe, Germany.

August 1-2. Norfolk Air Races, sponsored by Junior Chamber of Commerce, Norfolk, Neb.

August 1-2. Air Circus, Scotts Airport, Oroville, Wash.

August 1-2. Dedication of Galesburg Airport, Galesburg, Ill.

August 2-16. National Soaring Contest, Elmira, N. Y., auspices National Glider Association and Elmira Chamber of Commerce.

August 8. Christening of the Navy Airship Akron by Mrs. Herbert Hoover, Akron, Ohio.

August 29. Dedication of municipal airport, New Haven, Conn.

August 29-September 7. National Air Races, Cleveland Airport, Cleveland, Ohio.

September 1-3. Twentieth National Aeronautic Meeting of S. A. E., Hotel Statler, Cleveland, Ohio.

September 5-13. First Annual Air Fair, Binghamton Airport, Binghamton, N. Y.

September 7. International Gordon Bennett Balloon Race, Cleveland, Ohio.

September 7. Thompson Trophy Race in conjunction with the National Air Races, Cleveland, Ohio.

September 11-13. Third Annual Sioux Falls Air Races, Sioux Falls, S. D.

September 12-13. Fiesta of the Air, Los Angeles Municipal Airport, Los Angeles, Calif., in conjunction with La Fiesta de Los Angeles.

September 12. Schneider Trophy Race over the Solent and Spithead course, Southampton, England.

September 12-13. Air meet, auspices American Legion and the Aero Club of Pennsylvania, Municipal Airport, Philadelphia, Pa.

October. International air mail conference, Brussels, Belgium.

October 5-15. Tour of aeronautical and other industrial laboratories, auspices National Research Council. October 7.8. Production Meeting of

October 7-8. Production Meeting of the S. A. E., Book-Cadillac Hotel, Detroit, Mich. October 27-29. Fall transportation

meeting of S. A. E., Washington, D. C.

#### NEW YORK MUSEUM OF SCIENCE AVIATION EXHIBIT

THE purposes of the aeronautical division of the New York Museum of Science and Industry are: exhibition of educational models illustrating the fundamental
principles of aeronautics; collection of historic models illustrating the chronological
development of the art; collection of exhibits of a technological character illustrating the construction of aircraft, aircraft
engines, and aids to aerial navigation in the
broadest sense; and preparation of studies
illustrating the economic growth and sociological significance of aviation.

In the education models, illustrating prin-

ciples, the collection now contains among other devices a small wind tunnel with an open throat at its working section. In this throat, visible to the visitor, a number of models can be operated in turn. One model illustrates the value of streamlining. A tiny rectangular plate is shown balancing the air drag of a relatively enormous streamlined airship. Another model demonstrates the fact that it is the upper surface of a wing which does most of the lifting; in this device an airplane wing has been provided with suction holes along its surface and the suction of these holes acts on a number of gauges provided with colored liquid. The gauges indicate the magnitude of the suction of the upper surface and of the pressure of the lower surface of the wing. A third model demonstrates the stability of the modern airplane, which disturbed from its normal attitude tends to recover its original trim independently of the efforts of the pilot. It is very difficult to make the motion of air visible to the eve. but, since the flow of water is closely analogous to that of air, a water tank has been provided in which the water circulates steadily in a closed channel. The surface of the water is sprinkled with powder which makes the flow visible. The visitor can so operate the apparatus as to insert a number of different models in the water stream. He can note the disturbed flow in back of a flat plate or a round cylinder and compare it with the smooth flow round a streamlined strut. He can study the tip vortices which



The Eyerley "Whiffle Hen" powered with a Continental A-40 engine

peel off the edge of an airfoil.

The historical collection is yet young, but contains a model of the Pterangdon, a flying reptile and perhaps the very first flier the world has ever known. Next to this is a model of the Albatross, which has served more to inspire designers than any other bird. A scale model of the pigeon illustrates a flapping bird in distinction to a bird of the soaring variety. Models of Leonardo DaVinci's Ornithopter, the Wright biplane. Langley's Aerodrome, Bleriot's monoplane which crossed the Channel, the Spirit of St. Louis, a Fokker trimotor, and an autogiro suspended from the ceiling give the visitor a bird's eye view in model form of the historic development of the art.

Through the courtesy of the Army Air Corps, a collection of historic photographs has been started which will be exhibited in an optical machine in which the visitor will be able to devote as much time as he pleases to the study of each photograph.

The technological collection is growing rapidly. The Aviation Corporation has provided a two-seater Fairchild F 21, and close to the airplane itself, the complete structure of a similar machine is exhibited with all the main parts marked and labeled. A complete study of the interior structure of an airplane can thus be made by the visitor. The Curtiss Aeroplane & Motor Company has presented to the Museum a splendid collection of structural specimens, including ribs, spars, tail surfaces, tanks, engine mountings, and the like. The Aluminum Corporation of America's collection covers the various aluminum alloys, Alclad tubing, aluminum sections, etc., which are frequently used in aircraft construction. Edo floats are shown in section and in complete form

Statistical and economic studies of aviation have been begun and an attempt will also be made to illustrate the sociological importance of aviation.

The work of the aeronautical division of the Museum has received the cordial support of the industry.

The museum is located on the fourth floor of the News Building, 220 East 42nd Street, New York City. It is open free to visitors on week days from 10 a.m. to 5 p.m., except on Monday, when the visiting hours are from 1 to 5 p.m.

On July 15th a luncheon and short talk were given at the Museum to representatives of the press and aviation magazines after which the exhibits were explained in detail

#### NORTHEAST

American Legion Air Pageant SPONSORED by the Nassau County American Legion, an air pageant was held July 11-12 at Curtiss-Wright Airport, Valley Stream, N. Y. Ralph C. Cook was chairman of the pageant committee and William B. White, air pageant manager. They were assisted by a committee consisting of Al Cook, Robert Campbell and George Welsh and an advisory committee on aeronautics, consisting of Luther Bell of the Aeronautical Chainber of Commerce.

Captain Frank M. Hawks, Charles S. "Casey" Jones and Frances Harrell Marsalis of the 99'rs.

The program of events included air races, other competitive events and aerial exhibitions. An exhibit of a collection of World War planes was held in conjunction with the pageant. The program of events included a review of Boy Scout troops, a model-building contest, fireworks display and dancing in a hangar at the field. Music was supplied by a number of American Legion bands.

A NEW type ring binder has been put on the market by the Log Book Publishing Company of Mincola, N. Y., as a convenient and quick method of keeping the Department of Commerce Airway Bulletins in proper order for quick reference. These binders come in sets of nine regions covering the United States.

They are bound in red leatherette and lettered in gold, each state separated by a leather tab separator. A record sheet is inserted for convenience in keeping track of loaned bulletins.

The idea for these binders was originally conceived by Captain Kelly of Roosevelt

THE Curtiss-Wright Airport, Rockland, Me., has been commissioned an official weather reporting station by the Government. A twenty-four-hour service will be maintained. Three observers have been appointed to transmit reports every three hours. Miss Joanna Patterson, secretary to the base manager, and D. R. Snow, port of the base manager, and by this stationary will take the day shifts.

EXTENSIONS of air mail routes have been authorized from Boston, Mass., to Portland and Bangor, Me, and from Albany, N. Y., to Springfield and Boston, Mass., to be operated on a schedule of one round trip daily.

To Make Air Survey of Labrador

EN ROUTE to Labrador to make an aerial photographic survey this summer, an air party recently stopped at the Curtiss-Wright base, Rockland, Me., for refueling and final preparations. Personnel consisted of C. Rochevi, pilot; Commander MacMillan, navigator; and J. A. Newcomb, photographer. Their plane, the Vicking, a Lockheed Vega equipped with pontoons, is provided with special fuel tanks to increase cruising radius.



the Aeronautical Chamber of Commerce, William G. Swan and the rocket glider he successfully flew recently at Atlantic City, N. J.

The plane left Rockland July 5 for Onetalalk Bay, Labrador, where headquarters for the expedition will be established. Radio will be installed in the plane and communication during photographic flights maintained with the steamship Bowdoin.

#### Curtiss-Wright Summer Activities

IN ADDITION to its bases at Rockland and Portland, Me., Curtiss-Wright now has seaplanes stationed at Bar Harbor and Greenville and will shortly station another on Sebago Lake. Charles Treat, from the Rockland base, assisted by Arthur Poulin, is keeping an Ireland busy in the Moosehead Lake region. Al Graham, pilot, with David D. Preston as mechanic, is operating a Loening from Parker's Landing in Bar Harbor, where John Phillips has been stationed since the beginning of summer, operating a Robin on pontoons.

#### New Jersey Tightens Air Rules

THE State Aviation Commission of New Jersey has ruled that aircraft operating within the state must be licensed and registered with the U. S. Department of Commerce. This rule becomes effective for commercial planes August 1 and for private planes October 1.

After August 1, no one may operate a plane unless he holds a pilot's license issued by the Department of Commerce for the type of flying in which he is engaged. Other regulations provide that the pilot must have his license in his possession while flying and that authority from the State Department of Aviation must be obtained to participate in an air meet or exhibition.

THE Aeromarine Klemm Corporation, Keyport, N. J., is manufacturing and distributing planes under receivership, according to a recent announcement of company officials. Sales recently reported include a Model 85 to A. H. Swett, Jr., Pinebrook, N. J., and a Model 85 to E. Wolf, Caldwell, N. J., the latter using the ship for student instruction and solo flying.

THE Blue Ridge Flying Service, Waynesboro, Pa., has taken over the Hagerstown Airport, Middleburg, Md. The Blue Ridge Company, owned and operated by A. C. Pottorf, will maintain student instruction and commercial service. A Stinson Junior was recently added to the company's fleet and will be available at either field.

THREE air companies have been appointed distributors for the Kellett Autogiro: The Ludington Flying Service, the Wings Corporation, and the Atlantic Giro and Aviation Corporation of Atlantic City. The autogiros are manufactured by the Kellett Aircraft Corporation at the Philadelphia Airport.

SEVERAL new students recently signed up with the Wings Corporation for glider instruction. There are forty-five students taking the glider course at the present time. Nine of them have begun instruction in powered planes.

A NEW plane was recently added to the line at Somerton Airport. The new ship, a Fairchild, will be used for student training.

THE Precision Model Aircraft Corporation recently opened a workshop at Somerton Airport. The concern manufactures exact duplications of various types of airplanes in miniature for display purposes, in addition to other construction relating to model aircraft.

#### Sets Burbank-Pittsburgh Record

FLYING the new Pittsburgh Airways Lockheed Orion monoplane on which he had taken delivery at the Lockheed factory, Burbank, Calif., Pilot Harry C. Taylor recently established a record of fourteen hours and eight minutes flying time for the 2,285-mile trip from Los Angeles to Pittsburgh, Pa. He carried three passengers on the trip.

The elapsed time for the trip, including five stops for refueling and weather reports, was seventeen hours and thirty-seven minutes.

#### Elect Officers of C. G. A.

THE Cleveland Glider Association, comprising a number of motorless aviation club in Cuyahoga County, recently elected the following new officers:

L. F. "Louie" Ross, of the Cleveland Pneumatic Tool Co., honorary president; Fred B. Smith, an instructor of East Technical High School and a captain in the 112th Observation Squadron, Ohio National Guard, president; J. E. Wilber, Great Lakes Aircraft Co., vice president and Jack Yancher, Case College student, as secretary-manager.

Capt. Smith succeeds Mr. Ross who resigned as president. The latter will serve as referee of the Second National Glider Soaring contest during the first two weeks in August at Elmira, N. Y. He served in a similar capacity last year.

A LOW-WING model monoplane, built by Richard Herrick, fifteen years old, of Champaign, Ill., established a new world's record for sustained flight of sixteen minutes and eight seconds in the annual contest of the Model Airplane League of America, held June 30-July 1 at Dayton, Ohio.

THE Mansfield, Ohio, community chest sponsored a three-day air show starting July 24. More than thirty pilots competed for a total of \$1,000 in prizes. The chest is to receive all money over and above expenses.

#### New Ohio Air Companies

INCORPORATION papers have been issued to the Mazzolini Aircraft Company, Cleveland, Ohio. The company is authorized to issue 250 shares of no par value stock. The incorporators are Primo Mazzolini, Alfonso Mazzolini and Joseph C. Mazzolini. Incorporation papers have been issued to the Akron Airport Exhibition Company, Akron, Ohio. The company is authorized to issue 250 shares of no par value stock.

The incorporators are Robert Guinther, G. M. Neal and M. D. Ballard.

PORT BUCYRUS, the new sixty-fouracre airport at Bucyrus, Ohio, was dedicated July 19, according to announcement by Miss Lauretta Schimmoler, manager of the port. Air races, dead-stick landing, barrel rolling, consecutive loops and balloon bursting contests participated in by men and women pilots were included on the pro-

WARREN G. BAKER, sales manager for the Glenn L. Martin Company, left recently on an extended business trip to South America to secure new commercial and military business for the Baltimore firm.

#### Martin First-Half Production

THIRTY-ONE planes with a total value of \$1,650,000 were produced during the first half of this year by the Glenn L. Martin Company, Baltimore, Md., according to a recent announcement of company officials. The company produced thirty planes with a value of \$50,000 each and the XP-2, an experimental plane built for the Navy Department, Bureau of Aeronautics.

#### SOUTHEAST

#### Would Create State Board of Aeronautics in Georgia

CREATION of a state bureau of aeronautics is provided for Georgia in a measure introduced in the legislature in July. The board would be composed of the governor as chairman, with the chairman of the state highway commission, the secretary of state and the adjutant general as members.

The board would coöperate in the enforcement of state air laws, and would act as arbiter in cases not handled in the state courts. It would appoint a director of aeronautics with a salary to be paid out of fees collected and taxes. The director's term would be two years.

#### Candler Field Air Traffic

AIR traffic volume, both passenger and mail, as recorded at Candler Field, Atlanta, Ga., showed a considerable increase in June over May. In comparison with the volume handled in October, 1930, when the first scheduled passenger planes to serve Atlanta were put in operation, the increase is decided.

An average of 1,000 air passengers a month arrived at and departed from Candler Field in June, according to records of American Airways and Eastern Air Transport.

Air mail poundage at Candler Field in June amounted to 35,825 pounds, as against 34,852 pounds in May.

GAS and oil sales for June at the municipal airport, Tampa, Fla., were more than double those for May, according to a recent announcement of I. G. Hedrick, manager. More business was done at the field in June than in any other month since the airport was established. A total of 210 planes-stopped at the field as compared with 140 in May.

1T IS planned to construct an airport at Lake Parker, Lakeland, Fla. Facilities will be installed for both landplanes and seaplanes.

WORK has started on erection of a hangar at Taylor Field, Ocala, Fla. The hangar will be of fireproof construction, designed to house six airplanes, and will be completed in September.

#### NORTH CENTRAL

#### Airway to Build Radio Station

COL. L. H. BRITTIN, vice president and general manager of Northwest Airways, has announced that the company will build its own radio broadcasting station at Mil-waukce, Wis. The new station will have a two-way system permitting conversation between Milwaukce and the planes of the line and will be installed in the new \$33,000 Northwest hangar at the Milwaukce County Airmort

Northwest will replace its Fox River Valley planes with three six-place cabin Travel Air ships.

THE final resolution dissolving the Weeks-Holterhoff Flying Service, Inc., has been filed. The papers were signed by Elling O. Weeks, president. The Weeks Aircraft Company is now operating at Charlotte, N. C., and the Holterhoff Flying Service. Inc., at Brown Deer, Wis.

#### Stinson Reports on Test Flying

MODERN methods of airplane manufacture have done much to eliminate the element of hazard from test flying, according to W. A. Mara, vice president of the Stinson Aircraft Corporation, Wayne, Mich., who recently completed a study of test flying by pilots of the Stinson company. Since January 1, 1929, a record has been kept of all test flights made from the company's flying field. Over a period of thirty months, a total of 2,392 flights was made on which only three minor accidents occurred, not one of sufficient seriousness to endanger the pilot or result in injury.

#### New Airport of Entry

DESIGNATION of the Detroit, Mich., Municipal Airport as an airport of entry has been ordered by the Commissioner of Customs, F. X. Eble, according to a reent announcement of the Department of the Treasury. The field will be used for the landing of aircraft from foreign countries for a period of one year.

#### Light Plane Show

A LIGHT PLANE exhibition was recently held at Riverview Park, Chicago, III. There was a total of more than twenty exhibits of light planes, gliders and powerplants for light aircraft. A model building contest was held in conjunction with the exhibit. An altitude contest for light planes was held supervised by Col. P. G. Kemp of the N. A. A., and Major R. W. Schroder, Maj. C. W. Bryan, Rýng a NicholasBeazley Trainer, was first. John Gallagher and M. Lambert placed second and third, respectively, each flying a Heath plane powered with a Continental A-40 engine.

#### Improving Chicago Airport

NEGOTIATIONS for a ninety-nine-year lease having been successfully completed with city officials, an improvement program has been undertaken by the management of the Chicago Municipal Airport. Recent developments include drainage improvements and the construction of concrete ramps and a steel fence around the field.

#### Council Bluffs Airport

BIDS for hauling of cinders for construction of two runways at the municipal airport, Council Bluffs, Iowa, will be received by the city council shortly. The runways, to run from southwest to northeast and southeast to northwest, will be 2,600 feet long, 200 feet wide and six inches thick. Because the cinders in an abandoned line nearby have been donated for the hauling by the Omaha and Council Bluffs Street Railway Company, the total cost of the runways is not expected to exceed \$6,000.

A two-day air show will be held at the municipal airport as a part of the fall festival to be staged by the local American Legion, it has been announced.

Dr. W. S. Bowen and Clark Galloway, members of the municipal airport commission; and Chester A. Bowers, president of Council Bluffs Airways, Inc., compose the committee in charge.

#### Air Races at Norfolk

THE Noriolk Air Races will be held at Noriolk, Neb., August 1-2, sponsored by the Norfolk Junior Chamber of Commerce and the air race association which supervised the air races at York, Neb., July 4-5. It was announced by the management that a total of \$1,500 in prizes will be awarded the winners of the various events.

The program includes the following: Speed races open to planes in various cubic-inch-displacement categories, pony express and free-for-all races; dead stick landing and parachute jumping contests; civilian aerobatics and Air Corps exhibitions.

#### SOUTH CENTRAL

#### Kansas City Municipal Airport

THE decision of officials of Transcontinental and Western Air to transfer the general offices and operating base of the company to Kansas City has been announced. The city's central position geographically, its two modern airports, and the recent bond issue which will make available one-half million dollars for the improvement of the municipal airport, were important factors in the selection of Kansas City as the new headquarters for T, and W. A. The transfer is to be made at once and construction is to begin shortly on a new hangar at the municipal airport, which will accommodate multi-engined ships. The office building and hangar of the old Goebel Flying School will be enlarged and rented from the city. The new hangar, to be constructed by the city at a cost of about \$100,000, will be rented to the company at an annual rental of about five per cent of its cost.

AIR mail service between Kansas City and Denver, Colo., by way of Salina and Goodland, Kan., has been inaugurated by United States Airways.

#### American Legion Post is Organized at Airport

AN American Legion post, composed of members affiliated with the aviation industry, with fifty charter members, has been organized at the Lambert-St. Louis Municipal Airport, St. Louis, Mo.

Acting as advisory committee are: Major Albert B. Lambert, chairman of the Air Board of the St. Louis Chamber of Commerce; Walter Beech, president of the Curtiss-Wright Airplane Company; Col. Halsey Dunwoody, vice president of American Airways, Inc.; Phil Dec. Ball, and O. R. Parks, field manager of Lambert-St. Louis Municipal Airport.

APPROVED Repair Station Certificate 48, covering all types of aircraft servicing, has been iswed by the Department of Commerce to the Bredouw-Hilliard Aeromotive Corporation, Kansas City Municipal Airport.

Annual Traffic Report of Tulsa Airport A TOTAL of 93,844 persons flying in 26,135 planes was transported in and out of Tulsa, Okla., Municipal Airport during the year ending July 1, according to the annual traffic report recently issued by the airport management. These figures do not include passengers flying on taxi hops.

Since the airport opened in July, 1928, up to July 1 of this year, a total of 193, 753 persons has cleared the port in 46,000 planes, exclusive of sightseeing flights. Including sightseeing rides and school operations, a total of 240,000 persons has been cleared at the field in 51,500 planes.

The greatest number of passengers on a single day was carried October 9, 1930, when 691 persons arrived and departed in 110 planes. Scheduled flights for the year ending July 1 averaged thirty-six per day. Five air transport operators on scheduled services were using the field at the end of this period.

CONTRACT for the construction of the new \$65,000 administration building at the Oklahoma City, Okla, airport was let on July 7 to Guy Secor and Ralph James, Oklahoma City engineers. A contract for the lighting of the port was let to the Griffith Electric Company on a bid of \$12,000.

T. SCHIER and O. M. BOUNDS, Oklahoma City pilots, have started an air tour sponsored by the Conoco Oil Company, Schier is piloting a Ford trimotor and Bounds is piloting a Curtiss-Robin fiveplace job. The tour, covering 12,000 miles, touches thirty-one states.

FIVE hundred carloads of gravel have been laid on the runways at the new Oklahoma City airport. The east and west runway is 100 feet wide and 1,900 feet long and the north and south runway is 2,930 feet long. Cross runways connecting will also he laid.

THE Oklahoma-Texas Airlines, a new passenger line, has opened a route to Ponac City, Okla. The company will operate a daily plane between Ponca City and points south. The Oklahoma-Texas Airlines was established by R. H. Tarbutton.

PROPOSAL made by Oklahoma City aviation men to furnish gas and oil for planes and lunch for filters in the National Air Tour was accepted by officials of the races. The tour reached Oklahoma City July 19. Planes were serviced at the municipal airport by Oklahoma City oil companies, while flying enthusiasts and the chamber of commerce gave a luncheon for the visiting oilots.

#### Dedicate Shreveport Municipal Field

FEATURED by the visit of more than 100 military and commercial aircraft and numerous well-known pilots, the official opening of the municipal airport of Shreveport was held July 14.

Assembled for the dedication were airplanes from the Air Corp's Third Attack Wing at Fort Crockett, Texas. This unit will occupy Barksdale Field near Shreveport when the project, now under construction, is completed. Ten planes from Atlanta, Ga., also arrived for the event, and craft participating in the Ford National Air Tour made Shreveport a stopping point on their way from New Orleans to Houston.

The airport is one mile and a quarter north of the city and occupies a tract of 342 acres within a bend of Red River. The site was acquired and improvements made at a cost of \$30,000 for which a bowd issue was voted by the city. The field is 3,000 feet by 4,500 feet.

The administration building is a two-story structure, topped by a sixty-foot revolving beacon. The hangar, built of steel and reinforced concrete, is 500 feet from the administration building. It is 100 feet by 120 feet

The airport was first put in use on July 1 when planes of the American Airways transferred their base from Texaco Airport.

A RECENT survey shows that more than sixty-five per cent of Dallas, Texas, business men use air transportation on business trips, and even more would do so if the expense involved were less. Interviews have beat: held with 750 Dallas business houses, as part of a survey of air transportation in the Southwest, undertaken by National Air Transport, division of the United Air Lines.

ACTIVITIES at Love Field, Dallas, showed a marked increase during May over the corresponding period of 1930, according to a recent announcement of Preston Sneed, director of municipal airports. More than 1,461 planes operated from the field to and

from other cities, while the number of passengers and pilots totaled more than 4,000. These figures showed a fifteen per cent increase over April.

SOUTHERN AIRWAYS, INC., San Antonio, Texas, recently completed the construction of a commercial hangar at Winburn Field. The company, organized twelve years ago, is headed by L. A. Winship and E. C. Hammond. A fleet of open and closed ships is maintained for charter on cross-country trips or sight-seeing flights.

#### SOUTHWEST

#### Western States Air Convention

AVIATION representatives of eleven western states met in San Francisco July 9 at the annual Convention of the Western States Aeronautic Association, held in conjunction with a meeting of the California State Chamber of Commerce.

Highlights of the convention were as follows:

Chairman J. D. Wood of Boise, Idaho, urged uniform state and interstate airways and coördination of airways and highways. "State Regulation Airports" was discussed by David L. Logg of Seattle.

Capt. Roy Francis, superintendent of San Francisco Municipal Airport, spoke on "State and Federal Aid in Construction of Airports."

A tax on aviation gasoline for the special purpose of advancing aviation was proposed by several speakers and discussed by the convention.

W. H. Adams of the state chamber of commerce proposed that all airports be placed under compulsory rating and inspection by the Department of Commerce.

State highway heads and other department heads of many western states were in attendance at the conference.

#### W.A.E. Reduces Fares

REDUCTION of air passenger fares on the Los Angeles-San Diego route has been announced by officials of Western Air Express. The new rates are \$5 one way and \$9.50 for the round trip. This is in comparison with the former rate of \$7.75 one way and \$14.73 round trip.

THE name of Mills Field, San Bruno, Calif., has been changed to San Francisco Airport.

GORDON LAMB, eighteen-year-old graduate of the Oakland, Calif., High School, won the national non-flying scale model contest at Dayton, Ohio. He was awarded the national championship and a prize of \$200 for his model of the Boeing 203, the plane used in training students at the Boeing School of Aeronautics,

THREE Curtiss Hell Divers have been added to the aerial fleet of the Naval Air Reserve Squadron at Oakland Municipal Airport, Oakland, Calif. Four Vought planes from the U. S. S. Chicago are temporarily based in the squadron's hangar.

Boeing School of Aeronautics

THE Boeing School of Aeronautics graduated at the close of June the largest class in its history, including ten master pilots and fifty-seven master mechanics. Formation flying has been made a part of all advanced student work. For this phase of instruction, students must pass the 100-hour mark and complete precision

#### Air Activities At Ogden

WEBER COUNTY High School is stimulating interest in aviation by inaugurating a ground school in aeronautics. Nearly fifty students are enrolled in the class under the supervision of I. S. Noall of the state department of public instruction.

The Utah Air Travel Club is initiating new members at the Ogden Airport, the latest including David Williams, Ben F. Jones, J. C. Nelson, Vincent Iannone and Albert Iannone.

Ogden is prepared to welcome Lieut. Walter Hinton, who is to arrive here the latter part of May.

UTAH'S air law, regulating operation of unlicensed aircraft, requires both planes and pilots to be licensed to fly within the state.

EVIDENCE that Denver and Colorado are assuming positions of prominence on the national airway map was seen during the month when it was announced that the U. S. Department of Commerce has assigned an inspector and an airways mechanician to duty in Denver.

FORMATION of Reavis Flying Service, Inc., Denver, headed by Maj. Carlos L. Reavis, commander of the 120th Observation Squadron of the Colorado National Guard, was recently announced. The flying service will have the agency for Stinson planes. Herbert T. Henrikson is vice president and Robert C. Crosta, secretary and treasurer.

DAILY air passenger service between Denver and Casper, Wyo., was inaugurated recently by the Wyoming Air Service, Inc. Dick Leferink is president of the airline. One round trip is being made each day.

#### CONTACTS

By Frank E. Samuels

ABOUT one hundred miles northeast of Oakland is the new Sacramento Municipal Ariport, one of the best airports on the Pacific Coast, five miles south of town, with no obstructions on any side. New hangars of concrete and steel are nearly finished, as well as an administration building. The flying field is level, with three wide runways, each 2:000 feet long.

A few miles north of town is the privately owned Del Paso Airport, operated by Ingvald Fagerskog as a flying school and commercial flying field. Directly across the highway is the old Sacramento Airport, now the field of the Sacramento Flying Service.

South fifty-two miles, and less than ten miles north of Stockton, is the Orange brothers' airport. Many improvements have been made in the past year.

At Modesto, twenty-five miles south of Stockton, is the airport of the Hawke Crop Dusting Company, formerly the Aircraft Industries. The airport is large enough with long, wide runways, to accommodate the largest transport planes.

Calling at the Merced Airport, thirty miles south of Modesto, we were informed by Mr. Tedlow, who with Mr. Gallison leases and operates the airport, that they had been successful in the planting by airplane of 12,000 acres of rice during the spring planting

#### NORTHWEST

CONSTRUCTION has been started on the new administration building at the municipal airport, Helena, Mont, The project will cost \$3,365.

A PT-1 training plane has been presented by the Army Air Corps to the students enrolled in the aviation course of the University of Idaho, Moscow, Idaho. The ship will be used for observation and study on the ground and will not be flown.

AN AIRPORT site near Glens Ferry, Idaho, has been approved by A. C. Blomgren, state aeronautics inspector. The field has a runway of from 2,000 feet to 2,500 feet in length and a width of 200 feet. The width will be extended to 500

THE Chamber of Commerce, Hailey, Idaho, has accepted a seventy-six acre tract of land offered for use as a municipal airport by Mrs. Selma Friedman.

AERIAL war maneuvers were staged over Seattle and Tacoma, Wash., recently by thirty-four planes of the Twentieth Air Squadron, Army Air Corps, under the command of Maj. Clarence L. Tinker.

A CARAVAN of forty planes comprising the Pacific Northwest States Air Tour visited a number of cities and towns in Oregon, Washington and Idaho during the early part of July. Tour planes participated in an air show held at each of the stops on the route.

A MODERN airport at Wenatchee, Wash., is being planned by the Wenatchee Chamber of Commerce. New roads, highways, and an extensive building program will be undertaken at a cost of more than \$100,000.

COLLINS Pipe Company, Portland, Ore., has developed a perforated concrete pipe for road and airplane landing field drainage. More than seven miles of this new drain tile, six inches in diameter, is being laid in the center of the Old Oregon Trail between Haines and Baker. Tests on the airport showed that this drainage tile when placed nine inches underground will stand the pressure of twelve tons without a fracture.

#### NEW AERONAUTICAL BOOKS

#### SPEED

By Frank M. Hawks

APTAIN HAWKS has written the C APTAIN HAVES IN Story of his career in aviation. He tells how he posed as a newspaper reporter and got a free ride with a pioneer flier who later forgave the deception and instructed him in the elements of flying. His experiences as a cadet and instructor in the Army Air Corps during the war make entertaining and instructive reading; as do those of his barnstorming days and later his participation in modern commercial aeronautics.

There are first-hand accounts of his twoway and round-trip-record coast-to-coast flights and his transcontinental flight in a glider towed by a powered plane. Holder of numerous records for inter-city flying in the Travel Air Texaco 13 both in this country and abroad, Captain Hawks is an ardent exponent of speed with safety in aviation. He expounds high-speed flying in commercial aeronautics. The prediction is made that airplanes flying more than 200 miles per hour will soon connect the Atlantic and Pacific Coasts. He declares that an overnight air mail service across the country is

#### a logical development which must soon be

adopted.

In his high school days Captain Hawks was a football star and champion swimmer. He has been a life guard, actor in a stock company, bank clerk and rancher. As a barnstormer, he participated in the first refueling flight and became entangled in political intrigue in Mexico.

#### THE RISE AND FALL OF CAROL BANKS By ELLIOTT WHITE SPRINGS

HERE is the story of a war pilot who could not come down to earth once the battle clouds had blown away. Carol Banks, hero of this novel, is not purely the figment of Mr. Springs' imagination. He is an authentic species-a pursuit flier still fighting the war thirteen years after the armistice, if not in an S.E.-5, then in the club bar

There is no attempt to moralize. Mr. Springs has tried to produce entertaining and amusing reading, succeeding beyond anything he has done before. The book is a series of short stories, or episodes, interwoven into one embracing yarn about (Continued on following page)

#### TRADE LITERATURE

NEW PAMPHLETS AND BOOKS OF INTEREST TO THE AERONAUTICAL INDUSTRY

Nickel Steel in P. & W. Engines THE International Nickel Company, Inc., New York City, recently prepared a booklet, "Wasp and Hornet Engines and Their Use of Nickel Steel." The contents include a description of the parts and construction details of Pratt & Whitney Wasp and Hornet engines and photographs of military and commercial planes in which these powerplants are installed. The nickel steel parts in each of these engines are listed. A chart of the horsepower, specific and gross fuel consumption of Wasp and Hornet engines is included.

Aeronca Light Aircraft

A FOLDER on Aeronca light aircraft has been prepared by the Aeronautical Corporation of America, Cincinnati, Ohio, manufacturers. The Aeronca "Scout," powered with the Aeronca E-107A engine, is featured. Specifications, performance and details of construction are given. The Aeronca "Collegian" and the Aeronca "Cadet" are also discussed. An insert describing and illustrating the Aeronca C-2 is included.

Wasp and Hornet Engines "CONFIDENCE," a booklet describing and illustrating Wasp and Hornet aircraft powerplants, has been prepared by the Pratt & Whitney Aircraft Company, East Hartford, Conn., manufacturers. The booklet discusses the value of aircraft engine development in aeronautics and the use of Pratt & Whitney powerplants throughout the world, both in commercial and military planes. Production methods and construction details are included. A list of world's records established by planes powered with the company's engines and a list of United States and foreign operators using P. & W. powerplants are given. There are a number of photographs of planes equipped with Wasps or Hornets.

Roosevelt Field Restaurant
THE restaurant at Roosevelt Field, Mineola, L. I., N. Y., is described and illustrated in a small pamphlet recently issued. The text is devoted to the services and facilities available. Special menus are given and there are photographs of the lunch counter, soda fountain, upstairs dining room, open air terrace and the lounge room.

Armco Metal Cribbing
A BOOKLET describing the new metal cribbing developed recently by the American Rolling Mill Company has been prepared by the Armco Culvert Manufacturers Association, Middletown, Ohio. Drawings and photographs illustrate the installation of the cribbing, showing the appearance of both the open- and closed-face types when in place.

Armco Storm Sewers VARIOUS uses of Armco storm sewers, including drainage of industrial properties, and method of installation are described and illustrated in a catalog recently published by the Armco Culvert Manufacturers Association, Middletown, Ohio.

#### Colas Roads

COLAS Roads, Inc., New York City, has published a booklet, "Colas Roads," (Continued on following page)

PROPRIEMBRE BUILDING HOTELS SEMENTER BUILDING SE



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#### TRADE LITERATURE

(Continued from preceding page) which discusses the properties, uses and applications of Colas, on surfaces, including those of airports, and the services offered by the company. The text is illustrated with a number of photographs showing various applications of this prod-

#### Aluminum Fence Booklet ONE of the recent developments in the

fence industry has been the adoption of aluminum for the manufacture of woven wire fences, which are non-corrodable and do not require periodic painting to keep in good condition.

A booklet entitled "Why Aluminum Fence" outlining the development of aluminum and its utilization in fences has been issued by the Page Steel & Wire Company, Bridgeport, Conn.

#### ORGANIZATION

#### PUBLICATIONS

AMONG the contents of Skelly News of May-June, published by the Skelly Oil Company, are articles on the development of ethyl gasoline, uses of petroleum lubricants and greases, and state gasoline tax collections in 1930.

THE Pratt & Whitney Bee Hive for June features a story on the dedication of Rentschler Field, East Hartford, Conn., in conjunction with the annual maneuvers of the Army Air Corps. There is an article on weather observations made daily at an altitude of two miles by the Navy Department, using planes powered with Wasp engines.

In addition to general news of Pan American airlines, the June issue of Pan American Air Ways contains articles on the increase in the company's traffic, the air express service to seventeen countries in Latin America, and the New York-Atlantic airline with a schedule of six round trips daily with new reduced fares,

Autogiro News for June announces that the Smithsonian Institution will honor in a permanent exhibit the first autogiro flown in the United States. Results of the overload tests of the PCA-2 Autogiro at Langley Field, Va., are given, in addition to recent autogiro sales and general activities of the company.

#### NEW BOOKS

(Continued from preceding page) high-riding, quick-thinking, heavydrinking airman, eventually subdued by a

#### THE CONQUEST OF THE ATLANTIC BY AIR

By Charles Dixon

THE important and adventurous attempts in airplanes and airships to fly the North Atlantic Ocean since the conquest began in 1910 are recounted in this volume. Ms. Dixon tells the story of the first crossing in 1919 by the United States Navy pilots in the NC-4, that of the Englishmen, Alcock and Brown, Lindbergh's New York-Paris flight and those that followed, including attempts of the Do-X. He gives a full account of each trip and comments on its value.

Mr. Dixon, an English war pilot, discusses future air routes between Europe and the United States and the best type of plane to use. The author's attitude is that the conquest is not finished, rather that we have seen nearly the last of the purely sporting attempts and that henceforth flights will cease to be an adventure in the extreme sense.

#### WINGS OVER THE WORLD Edited by Joseph Lewis French

T HIS volume has been prepared by Mr. French as a record of aviation achievement during 1930 and up to the present time. The contents comprise material previously printed in a number of aeronautical publications. Among the contributors are Frank M. Hawks, who also writes the introduction; Amelia Earhart Putnam, Richard E. James, Louis Bleriot and Sir Hubert Wilkins, Several articles are reprinted through the courtesy of AERO DIGEST and The Sportsman Pilot.

There are stories of the air mail, record distance and altitude flights, gliding, women in aviation, aerial expeditions, foreign aviation and air travel development.

#### LEARNING TO FLY FOR THE

By LIEUT, BARRETT STUDLEY

THIS is the story of the experiences of a typical student at the training center, Naval Air Station, Pensacola, Fla. The story is written especially for those who are considering taking training for designation as Naval Aviator and receiving a commission as a Reserve officer in either the air arm of the Navy Department or the Marine Corps.

The book is intended to present enough practical information and sound advice to be of value to any student pilot. It is sufficiently readable to attract boys who are not yet old enough to start active training as student pilots.

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## FOREIGN NEWS IN BRIEF

Compiled from reports from AERO DIGEST correspondents and the Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce

#### **ENGLAND**

175,000 Attend Royal Air Force Display
THE Royal Air Force Display, held
annually to depict progress in airplane
design and in piloting skill, is conceded to
be of utmost interest in British aeronautics.
The latest type service and civilian planes
are exhibited and flown and the most recent
developments in military flying are demonstrated.

This year, at the Hendon Aerodrome, on June 27, more than 175,000 spectators were present at the Twelfth Annual Royal Air Force Display. Several new types of formations were executed. These maneuvers were introduced primarily to illustrate the ability of pilots flying the latest high-speed aircraft to change flight position rapidly. The new British day bombers and fighters displayed at the exhibition are faster by some sixty miles per hour than their immēdiate predecessors.

The fastest aircraft developed by Great Britain were flown at the R.A.F. display. These are four single-scater fighting craft, including the Hawker "Fury," which climbs to 20,000 feet in nine minutes, and the Gloster S.S. 19 with six machine guns and a high speed of 194 miles per hour. Other recent military planes include the "Avro" 626 in which seven different types of service flight training may be done; the Short "Gurnard," a two-seater amphibion fighter, and General Purpose long-distance or high-speed day or night bombers.

It is of significance that each of the new British military planes is of the biplane type. Among the planes exhibited in conjunction with the display were three civilian air-craft classed as "research" planes. These were the Handley Page "Gugnunc," a two-place biplane utilizing the Handley Page slotted wing; the Cierva autogiro, and the "Pterodactyl," a tailless, two-or-three-place, cabin monoplane.

TWO flights of single-seater Bristol "Bulldog" fighters, each consisting of four planes and piloted by officers of the Swedish Flying Corps, have been flown from London to Sweden, where they have been added to the flying equipment of the Swedish corps. The Bulldog is an all-metal biplane with a high speed of 180 miles per hour and a ceiling of more than 29,000 feet with full military load.

#### **GERMANY**

EDWIN P. A. HEINZE

THE Luft Hansa, having issued a pocket timetable of its airlines with all necessary information for calculating the costs of an air journey or the charges for the transport of goods by air, has inaugurated a competition open to the general public, barring employees of the company. Competitors must calculate the costs of a flight between Geneva and Leningrad, which can be accomplished within twenty-four hours; state the time of departure from Geneva in Switzerland and of arrival at Leningrad in Russais; and estimate charges for the transport of seventeen pounds of express from the small town of Tilsit in Germany to London. The esti-

mates must be addressed to the publicity office of the company on a postcard by August 31. This is rather a novel idea for inducing people to study the airline timetable and familiarize themselves with it.

THE first of several trimotor Junkers, ordered by a Grecian Airways Company, has been delivered.

THE recipient of the Hindenburg Cup for 1930, Herr Schlerf of the club Badische-Pfälzische Luftfahrt-Verein, has announced that he did not receive the gift of \$2,500 but that this award went to the club. Herr Schlerf said he would not accept a pecuniary reward for his own personal use.

ON September 6 the German championship of the air will be contested at the Central Airport of Berlin.

THE flying schools of the German Aviation Union have reduced training fees twenty-five to forty per cent. It is now possible to become a qualified pilot for \$167.

REGULATIONS for the twelfth Rhoen Sail-flying Contest have been issued by the Rhoen-Rossitten Society of Frankfort-Main.

THE aviation clubs of the Gelsenkirchen, Dortmund, Muenster and Essen districts have jointly founded the Borkenberge Society, with the object of supervising the new Borkenberge flying ground and school.

## TRAINING FOR SCHNEIDER CONTEST

W ITH the arrival of the British highspeed pilots at Calshot, the Royal Air
Force base on Southampton Water, later
stages of training will begin for the
Schneider Trophy contest to be held over the
Solent and Spithead on September 12. Calshot is the station selected again this year,
as in 1929, as the headquarters of the competing teams. Special accommodations are
being arranged for the French and Italian
pilots who are to arrive August 15. From
that date on, planes entered in the contest
will fly daily in preparation for the contest.

Under the command of Squadron Leader A. H. Orlebar, leader of the 1929 team and holder of the world's speed record of 357.7 miles per hour, the 1931 team will continue at Calshot the training begun at Felixtowne.

Six different types of fast scaplanes have arrived at Calshot for practice flying. Three of these are speed craft built primarily for participation in the Schneider races of 1927 and 1929 and each is powered with a Napier Lion racing engine. These are the Gloster IV biplane of 1927, modified since the contest, held that year at Venice, to make it more suitable for practice flying; the Super-

marine S5 monoplane, winner of the 1927 event; and the Gloster VI monoplane built in 1929. The other planes are Fairey service biplanes on floats, the oldest of which is the "Flycatcher," for several years the standard fighter of the Fleet Air Arm, now used to introduce high-speed pilots to seaplane flying. The other Fairey craft are a "Fleetwing," a two-place fleet flighter, and a "Firefly," single-seater, comparatively new machine;

A second Supermarine S5 and another Gloster VI are being reconditioned by the manufacturers. The two S6 monoplanes which competed in the 1929 race, (one of them won at 328.63 miles per hour and the other set up the new world's record over 100 kilometers) are undergoing considerable modification. The Rolls-Royce company is preparing new engines, giving increased power, for these ships and certain alterations are being made in the structure.

Two new Supermarine monoplanes, which will probably be termed "S7," are being built for entry in the contest. In the construction of these ships it is intended to incorporate lessons learned by plane and engine designers in preparing for previous contests.

VALUE of aerial survey was again demonstrated by the success of a Junkers survey plane operating in Bolivia, where it is planned to erect hydraulic electricity works in the mountains. A land survey requiring an exceedingly long time, airplanes with photo equipment have been taken into service. In one of these Junkers has been discovered from the air a glacier and a lake both of which are immensely important to the whole project. The machines must operate in an altitude of more than 19,000 feet.

#### FRANCE

Start Air Tour of Europe

A SQUADRON of six long-distance cruising planes took off from Paris for Brussels July 9 on a one-month's tour of Europe and the Near East. The cruise is being made for the purpose of advancing the interests of aviation.

The squadron was commanded by General De Goys and each plane was piloted by a well-known French pilot, including Major Dicudonne Coste. The remainder of the personnel comprised mechanicians from airplane and engine factories.

ne itinerary permits lengthy stops as desired and speed and distance records will not be sought. An approximate distance of 6,000 miles will be covered.

#### Study Air Defense of Dunkirk

STAGED under the direction of Marshal Pétain, a simulated air attack was made recently on Dunkirk, which was the target for 175 enemy air raids during the war. The experiment, made to test new equipment for air defense, especially the detection of enemy aircraft, was declared successful.

"Raiding" planes were detected by sounding instruments at their departure from St. Inglevert Airdrome, were sighted by means of other instruments and theoretically put out of action by anti-aircraft artillery. Radio, special optical instruments and the city's regular telephone system were utilized.

#### Le Bourget Air Traffic

AIR TRAFFIC at Le Bourget Field during 1930 included the arrival and departure of 4,964 and 5,001 planes respectively, carrying a total of 39,783 passengers in regularly scheduled operations, according to information recently made available. During the first quarter of 1931, 800 planes carrying 2,949 passengers arrived at the airport and 791 planes departed with 2,350 passengers.

#### Automobile Company Will Sell Touring Planes on Installment Plan

AN AUTOMOBILE distributor has organized an airplane department for the sale of touring aircraft and will accord terms of payment similar to those granted for the sale of automobiles. Eleven different types of planes produced by five or six well-known aircraft manufacturers are of-fered, ranging in price from \$1.301 to \$2.547.

Payments may be made in installments over a period of from twelve to eighteen months. A part of the list price is paid by the state from a fund set aside for this purpose. The amount varies with the type of plane and with the class of purchaser—private individual, flying club or military pilot. In addition, the state will pay from this fund a certain amount for each hour of flying accomplished with the plane.

The sales company has organized a flying school where it will teach prospective pilots to fly, or the concern will furnish an instructor \$100 per month to prepare the purchaser to qualify for a pilot's license. The company has compiled a table of expenses on the basis that a plane can be used for four years at an average of 200 hours each

#### CANADA

#### Plan to Reduce Aviation Costs

A REDUCTION of approximately fortyfive per cent in Canada's expenditures for aviation during the fiscal year ending March 31, 1932, has been proposed by the Dominion Government. The estimated aviation budget for the next year, as tabled in the House of Commons, totals \$5,142,000, a decrease of \$2,333,700 from the total of the last year.

The items in the new budget are as follows:

Civil air operations such as aerial photographic surveys, forestry patrols and establishing airports, \$2,766,000, a decrease of \$1,289,000.

Training, including all expenses in connection with the maintenance of the Air Force, personnel for civil air operations and the provision of necessary facilities, \$2,266,000. a decrease of \$244,000.

Expenses in connection with the establishment and maintenance of air mail routes and intermediate fields, etc., \$100,000, a decrease of \$800,700.

In addition to the above items, the estimate for the post office department's outside service includes \$1,500,000 for mail service by air. This sum represents a decrease of \$412,000 over the appropriation for the preceding year.

NIGHT flying of air mail over the prairie provinces has been made possible by the installation of the last of a series of five radio beacons on the "A & N" system. The western ridio beacons have been installed by the Canadian Government at Forest, Regina, Maple Creek, Lethbridge and Red Deer.

SQUADRON LEADER J. H. Tudhope, recipient of the McKee Trophy of 1930, has resigned from the R.C.A.F. to take charge of flying operations of British Columbia Coastal Airways, Ltd., Vancouver.

#### Revise Plan to Cancel Air Mail

PLANS announced by the Dominion Government for canceling air mail services in Canada because of postal deficits have been abandoned. Present air mail contracts have been canceled, effective August 15, when new contracts with revised rates and schedules will probably be made, according to recent advices emanating from reliable sources.

#### Trans-Canada Air Pageant

PARTICIPATING planes in the Trans-Canada Air Pageant left Hamilton, Ont., July 1. Late last month the pageant was in Western Canada on the first half of its 7,700-mile tour. The pageant is scheduled to visit Vancouver July 22, return to Halifax by August 27 and finish in Ontario about Seotember 8.

The tour includes a squadron of Siskin fighters of the R.C.F.C., a Ford trimotor, twin-engined Saro amphibion, a Pitcairn Autogiro and a number of light planes.

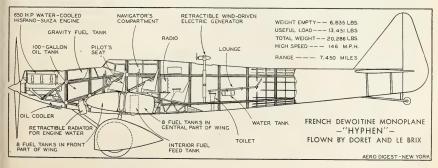
#### **JAPAN**

THE number of planes owned by civilians and commercial operating companies increased from twenty-two at the end of 1921 to 125 at the end of 1930. During this period the number of licensed plane pilots increased from twenty-eight to 289. At the end of 1930, there were 112 dirigible pilot licenses in effect.

A NET profit of approximately \$202,391 for the year ended September, 1930, has been reported by the Japan Air Transport Company, Ltd. Gross revenue for this period totaled \$852,335 of which approximately eighty-five per cent cent consisted of subsidy from the government. During this period, the company increased its services, operating forty-seven planes.

The company was incorporated in November, 1928, for the purpose of establishing an air transport service carrying mail and passengers between Tokio, Osaka and other cities in Japan. Operations were started in April, 1929.

A subsidy of \$9,970,000 will be paid to the company by the government over a period of eleven years.



#### LATIN-AMERICAN AVIATION

Operations by Cuban Air Company
A IR mail and passenger transport service
is maintained daily except Sunday
between Santiago and Baracoa via Antilla
and Cayo Mambi by the Cuban National
Aviation Carfiss Company. This line is an
extension of the company's service from
Havana to Santiago, Cuba.

One-way fare between Santiago and Baracoa is \$20, with no reduction for the round trip. As an inducement for the use of air transport service on short trips, the company has established a special schedule of prices in which tickets are contingent on space being unsold at the regular price. If all space on a plane has been sold, passengers holding reduced-price short-flight tickets must wait until space is available. The only advantage in the use of the reduced tickets is on the intermediate stops. When a through ticket is purchased a greater saving results than that provided on the special rate.

Twin-engined amphibions are operated from Santiago to Baracoa. Trimotored transports are used on the Havana-Santiago division

A special Sunday air excursion service is maintained from Havana to the Isle of Pines. The plane leaves on the condition that more than eight passengers make the trip. Sightseeing automobile trips are provided on the island. The round-trip fare is \$20.

FOR the purpose of promoting aviation in Cuba, the Aviation Club of Cuba has been organized at Havana. The membership in the association was originally limited to fifty members but the requests for admission were so numerous that it was decided to extend the limit to 100 members. The club has purchased a Waco plane which will be used to train non-fliers and by qualified pilots to increase piloting hours. The club plans the purchase of an additional plane.

THE LATIN AMERICAN Air Legion, Cuban Division, was inaugurated recently by Col. Luis Fardois, prominent in Cuban commercial aeronautics. The purpose of the organization is to promote closer relations among Latin-American pilots.

#### Mexico Miners Adopting Air Transport

ACCORDING to information received by the department of mines of the Secretaria of Communications and Public Works the mining companies in northern Mexico are building landing fields and arranging with air transport companies for the transportation of metals from the mining areas. Negotiations have been completed with the Cia. Aeronautica de Transportes for the extension of its route from Matamoros-Mazatlan to Teyoltitla in the San Dimas municipality of Durango, a distance of 110 kilometers.

A mining company in Mexico City has constructed a flying field at a cost of 60,000 pesos and has obtained permission from the secretaria of communications to use this camp for transport. The company has acquired an airplane to carry its metal to Mazatlan. A flying field has been constructed and an airplane purchased by the West Mexican Mines Ltd., for use at Guadalupe y Calvo and Parral in Chibuahua. Other mining companies are planning to adopt air transport to replace mules. The trip via plane, which can be made in two hours, requires several days by mule pack.

## Mexican Airline Traffic Increases An increase in the use of airplanes for passenger, mail and express transportation in Mexico has been announced by the secretary of communications. An increase was reported on practically all of the airlines. The heaviest traffic is on the Mexico CityTampico-Bromsville route.

PLANE service has been inaugurated between Nogales, Sonora and Guadalajara, stopping at Mazatlan where the airport has been improved for the convenience of passengers

THE AIR CLUB OF PUEBLA in Mexico was organized recently by the governor of the state, Dr. Leonides Andreu Almazan. He plans to open a flying and ground school.

AN international air express service from the United States to Mexico City has been inaugurated by Compañia Mexicana de Aviación, Mexican division of Pan American Airways.

A COMMISSION of engineers from the department of communications, working in conjunction with the mayors of the largest cities in the western states of Mexico, are selecting the most suitable of the airport sites offered by the officials of the various cities. The sites will be developed into intermediate airports on the airlines planned along the west coast.

PLANES or "Scadta," German-Colombian air transportation company, flew a total of 727,868 miles in 1930, according to information recently made available. A total of 4,791 passengers and 1,019,477 pounds of freight were transported by Scadta planes during this period.

#### New Colombian Flying Club

THE first flying club in Bogota will be organized in the near future. The organization, known as the Santa Fe Aero Club, was formed by Jorge Vargas Cualla, civilian pilot. He will instruct members in ground school work and flying. A Bird plane was recently purchased from the Bird Aircraft Corporation, Brooklyn, New York, U. S. A.

THE COLOMBIAN government has contracted for three Curtiss Fledglings with the Curtiss Aeroplane & Motor Company, U. S. A.



Capt. Enrique Valverde

CAPT. ENRIQUE VALVERDE of the Santo Domingo Air Force recently left for New York City to make an extended stay in the United States. He will visit aircraft and engine plants to study American methods of design and production and will take a course of advanced flight training.

#### Flying Clubs Sponsored in Ecuador on Increase

ORGANIZERS of the first aero club in Euclador include men prominent in political, military and business circles. Among the founders of the organization, known as the Aero Club de Guayaquii, are Senator Leonardo Sotomayor y Luna, ex-minister of war and aviation; Alberto Guerrero Martinez, prefect of Guayaquii; Manuel Seminario, manager of the Mortgage Bank of Ecuador; and Dr. C. D. Andrade, president of the Rotary Club of Guayaquii.

As a result of the encouragement given private flying by the organization of the first club, four other aero clubs have been formed. These have been established at each of the following cities: Manta, Bahia de Caraquez, Portoviejo and Esmeraldas.

REGULAR courses of instruction have been started by the first glider club formed in Argentina, given by three powered-plane pilots and three glider pilots. Operations are conducted on the airport at Moron in the province of Buenos Aires. The club has twenty-eight members and uses an American glider.

THE Aero Club Oriental of Santa Cruz de la Sierra in Bolivia plans to increase flying activities and to purchase a plane in addition to the one being operated by the club. Luis Velasco Franco is president.



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Here is my  $\square$  check  $\square$  money order for five dollars. You can save me the time and trouble (also the \$3.40) of running down to the corner newsstand every month.

if you figure it our way



## THE KWEI COMPRESSED AIR MOTOR

TELL, here we are all dressed up with a new heading "Experi-mental." Thanks to Mr. "Bill" Heaslip it is even more attractive than our former "Junior Activities" which has been running since August, 1929. Bill, too, agrees with us that his latest effort is better. It really should be, for just think of all the airplanes he has drawn since 1929. To those who are fortunate enough to visit his busy studio in New York City, it seems that his production of planes is greater than that of all our factories added together. He certainly turns them out neat and trim and beautifully colored, too, Drawing airplanes is his specialty.

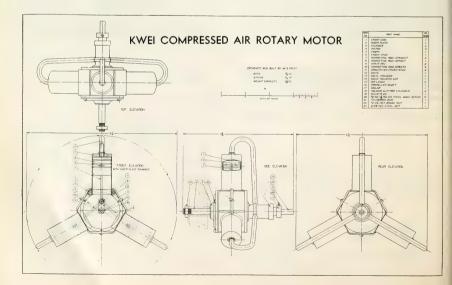
So much for our friend "Bill" and the new heading. The next thing is: "Why the change?" Well, here's the reason, for it is no secret. It is just another progressive step. Ambitious magazines like ambitious individuals must progress and R. E. DOWD

each department must do its bit. In this case our many friends and readers have urged us to broaden our Junior Activities. It has been a great help, they tell us, but could be even greater by including light planes, gliders, engines and design data. However, let's not feel that our younger readers are being forgotten. The subjects are to be carefully chosen to be of interest to all and a special effort with be made to describe each so clearly that boys from "nine to ninety" will find the articles interesting and helpful. So let's go! Here's our first one:

#### Kwei Compressed Air Motor

The name of Kwei is already known to our readers for the Kwei Flemming-Williams Racer appeared in our section August, 1930. To our new readers we might say that Mr. Ming S. Kwei is a Chinese aeronautical enthusiast. His experimental work dates back to 1909 when he was to be found entering English model plane competitions against such well-known builders as Messrs. Bragg-Smith and V. E. Johnson.

Even in these early days Ming sought after a small engine to replace the rubber strand motor. Several were purchased, mostly as imported articles from France, but these were found excessively heavy and inefficient. A large biplane model with such a powerplant succeeded wonderfully as an ornament but failed utterly to fly. Subsequently, both in England and at home, durations of upwards of a minute were made with compressed air models. In this country Mr. Frank Schober seemed to take the lead while more recently Bertram Pond's engines have attracted much attention.





## a Practical Airplane for Everybody

Especially engineered and built for the private owner-for the man who wants to do his own flying-and do it with ease, comfort and pleasure.

That's the Cain Sport. Full size, powered with the 95 H.P. Cirrus Hi-Drive Motor, holder of many distance and endurance records. The Cain is built for you to fly-with little experience.

Landing speed is an honest 35 miles an hour in still air-or less. Quick take off, fast climb, and in the air it practically flies itself. Mile after mile with hands off the stick. Full control at even stalling speed!

And the Cain is roomy and com-fortable. The draft-proof cockpit is entered by two full size automobile type doors. The entire cockpit is luxuriously upholstered. The floor is carpeted. Control mechanism is concealed beneath quickly removable floor boards. The whole cockpit is as clean and inviting as the interior of a fine car.

The Cain marks a new day in flying. It has too many features to describe here. Send the coupon below for illustrated literature and full details.

#### Dealers

A new type dealer plan with attractive possibilities will be explained to you upon request. Some profitable terri-tories are still open. In sending coupon, attach letterhead or business card.

#### **Specifications**

Span, 34 feet. Length overall, 23 feet, 8 inches. Weight empty, 1,070 pounds. Top speed, 110 miles per hour. Flight range with 2 passengers and 100 pounds of baggage, 550 miles. Baggage compartment takes four full-size Gladstone bags. Standard equipment includes wood propeller, tachometer, oil thermometer, oil temperature gauge, altimeter, fuel gauge, safety belt, tool kit, 35 gallon gas tank and 6:50 x 10 air

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#### AIR-HOT AND OTHERWISE

(Continued from page 38)

mittee had unanimously approved it and the House had passed it. But when it went to the Senate (being left there at the mercy of its enemies) a "modernization program" was substituted. This allots thirty million dollars to reconditioning the battleships "Mississippi," "Idaho" and "New Mexico" and, as a rider, the construction of eleven destroyers, also requiring armor plate, although we have upwards of 200 such craft now, a large proportion of them lying "dead" at docks at San Diego and elsewhere, out of commission because useless. The vote by which this startling, even rather terrible result was won, this victory of a plan which when presented was regarded as hopeless even by its friends, was 72 to 13. The strength which suddenly developed astonished even its sponsors.

Not hard to guess just who the friends were, who saw to it that this "unexpected" strength was ready when the moment came.

Nice work for them. Modernization of those battleships won't have the slightest effect on our allotment of new warship construction at the next Armament Conference, while new building would have. A pretty pick-up for the steel ship industry.

IT WAS PUT ACROSS BECAUSE THAT INDUSTRY WAS FULLY ORGANIZED IN WASHINGTON AND WIDE-AWAKE ENOUGH TO SLIP IN AND SNATCH THE MONEY FROM US AFTER WE HAD GOT IT VIRTUALLY IN OUR HANDS. IT SNATCHED IT EVEN THOUGH BY DOING SO IT SWINDLED THE UNITED STATES WHICH WOULD HAVE BEEN HONESTLY PROTECTED IF THE PROGRAM FOR WHICH WE DID NOT EVEN FIGHT HAD BEEN CARRIED THROUGH.

Think about this dainty trick which was so definitely "put over." And even if we get from the next Congress that which we failed to get from the last one, none of the ships we get can be finished before 1935, enabling the Arms' Limitation Conference of that year to rule them out if it so wills. Meanwhile the most part of the money will have gone into the coffers of the steel makers and none of it into trose of the air industry.

In other words, battleships and destroyers, archaic weapons, are in the ascendant, and aviation, which means the weapons of the present and the future, is virtually in the discard.

The American merchant marine enterprise, which could not succeed because of inability to compete with foreign low wage construction and operation, has done rather better than its critics foretold. It recently has won ocean mail contracts calling for forty-eight new vessels aggregating 605,966 tons and costing \$243,547,365. Reconditioning affects cight vessels and will cost \$36,150,000. Reconstruction affects 39 vessels and will cost \$17,122,510. These and new vessels represent in all a cost of \$296,819,875.

Thus America's "economically impossible" shipyards will cperate under present orders in every instance for two and in some instances for five years, with part of this program under way and two new ships already in the Mediterranean service—two others in the Havana service and two more scheduled to start in Hamburg service during the month.

This is what organized effort of the right kind will produce!

The writer spent the better part of the last four weeks of Congress in Washington and there has had an opportunity to observe the effort of one individual, Admiral William

(Continued on following page)



## Why did this squadron win?

Skillful piloting... superior planes...all of them Boeing Pursuits, Wasp-powered. This combination won for the 95th Pursuit Squadron of Rockwell Field the honor of serving as the Exhibition Pursuit Squadron during the recent praiseworthy maneuvers of the Army Air Corps.



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#### Cause or Effect?

••• Aircraft registration records show only ONE make with number of active licenses totaling into four figures ... and that one make is WACO. • The evidence is conclusive, also, that there is one make of aircraft supported by adequate nation-wide service facilities ... and that one make again is WACO. . Whether this Service organization is a cause or an effect of Waco Popularity is a most question. Whatever the answer, the significant fact is that Waco Service is always within a short hop of any Waco . . . anywhere . . . at any time. Which IS important! Don't overlook it in making your selection. For it makes your Waco a means of care-free travel...makes its ownership a matter of enduring satisfaction.

The complete WACO line ranges from \$4450 to \$8525, with Heywood starter standard equipment on all models.

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AUR ART THEOT



(Continued from preceding page)

E. Moffett, who honestly and sincerely strove for that building program which would have meant so much to us. Had the aeronautic industry given him the right support during the whole Congressional session, the original bill never would have been sidetracked in the Senate and the millions worth of business would not have been lost to the industry that needed it so badly.

. Do you need another instance to illustrate what we must do? I could cite many showing that the right kind of thinking and effort might have produced not fifty millions but hundreds of millions worth of business for us.

Just what is lacking in the Five Year Program? A shortage of officers, personnel and serviceable flying equipment still exists under its requirements. F. Trubee Davison delves into this matter in his annual report. Pages of statistics naturally would be necessary to a detailed study, but certain object lessons may be briefly stated. The recent Air Maneuvers showed but 672 planes, although it was understood that all available were in the air. Well, to get them, every possible usable machine that could be drafted was mustered into service, even including the training planes at the Air Corps Flying School at Kelly Field and borrowed National Guard equipment.

The report also reveals that at the close of the fiscal year the Army Air Corps had 1266 officers, 12,086 enlisted men, 1319 planes on hand and 211 contracted for. Of the 1319 "on hand" only 672 were serviceable as defined by the authors of the act creating the Five Year Program, although there should have been 1520. The shortage of personnel shown is in proportion to the shortage of machines.

The cause of all the shortages, naturally, was lack of appropriations and the lack of appropriations had been due, certainly in a great measure, to lack of YOUR interest, gentlemen of the aeronautic industry. Your lack of interest in what? YOUR LACK OF INTEREST IN YOUR OWN BUSINESS!

We want nothing that rightfully should not be given to us. We are no more righteous than the armor plate men. But we are of the moment and the future and they are of the past. That we should now succeed, prosper, and develop, is as important as it was that they should do the same two score years ago, before warfare had been changed by the World War to make their product obsolete. They know that time, science, and the intensity of international competition in armament have combined to write their doom across the skies wherein we fly. So they work-and work intelligently, hard, almost desperately in Washington-for their final profits. While Congress is in session they strive ceaselessly-strive as we should strive but do not. They had no Five Year Program. If they had had one they would have fulfilled it. We have not worked, and so our industry is short some scores of millions which it might just as well have had.

A new Congress will meet next December and unless we organize ourselves, equip ourselves to get those things to which we are entitled and which it is as needful to the country as it is to us that we should have, for 1932 and 1933, we shall again be left out in the cold as far as Government business is concerned, as we were in 1930 and 1931.

If we organize and fight for them, many things may happen. Among them the Reserve will be given sufficient flying time and the machines to use with it; the Air Mail will have more and improved planes and be extended in its scope; Army and Navy will be generously provided and the country will be safer against that future war which we must not fool ourselves into believing will be forever or even very long postponed.

All this building of additional airplanes will help toward carrying out the President's program of forcing real prosperity to emerge out of the business slump.

Gentlemen of the air industry, if these things do not happen down in Washington you may blame yourselves.

All the world is trying to help you, supplying you and the public with education about and arguments in favor of your endeavors and product. For instance, Sir Samuel Hoare, formerly Air Minister of England, warns that the next war will not be miraculously prevented, or even unduly delayed, and that it will be very different from anything which had gone before. Things first are dreamed and scoffed at, then carefully considered, then realized and used, then superseded. We of the aircraft industry are at the threshold of great days. . . . OUR days. Aircraft have been tried out and proved. Our national defense well knows that it must have aerial fighting instruments. All that is needed is that Congress should be educated to the knowledge that the air industry, dollar for dollar, can deliver more and better national defense than any other. Teach this to Congress and two great things will be accomplished: We, as a nation, shall be prepared to thrust back the would-be invader when he comes, as he is SURE to come, and, as an industry; we shall get and, during our span of rightful domination hold that high prosperity to which we are definitely entitled.

Gentlemen, it is up to you. We of AERO DIGEST will try to do our share. So will the whole press of the United States and so will Congress, if you but give them opportunity and the sort of help they need if they really are to work with you and for you.

#### CIVILIZATION C.O.D.

(Continued from page 37)

you haven't made and may never collect. It is not like the Soviet plan, which is a sort of perpetual motion machine that is bound to fall to pieces if it ever stops. It is not like the financing of Mr. Ponzi, which worked beautifully so long as the supply of suckers held out.

It is simply a process of paying the bills yourself, instead of deeding and bequeathing them to your descendants, heirs and assigns. And certain sensible people are beginning to think that this is the most practical plan that can be suggested to make the world safe for tomorrow and comfortable for to-day.

There are two possibilities for which a nation needs a plan. One is peace and the other is war. It is wise and necessary to plan for both of them. If a nation plans only for peace, there is a serious likelihood that it will be a plum for anybody's picking when the world around it goes to war. If it plans too thoroughly for war, it may be tempted to cook up a war in order to see if the machinery will work according to specifications. Or the war plans may overlap with the plans, peaceful or otherwise, of some other nation, and start an argument.

At this moment the American people are puzzled by in apparent contradiction between two sets of plans, both of which seem sensible. One is a plan for a minimum national defense—a Navy as good as the next-door neighor's, an adequate Air Force and a trained Army, plus an reganization of industry in readiness, for any emergency. The other is a plan for peace, including a policy of reduction of armaments which we are trying to promote in

(Continued on following page)

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## EASY PAYMENT PLAN

For your safety and the safety of Aviation, we now offer Switlik Safety Chutes on an EASY PAYMENT PLAN . . . Every pilot should own a parachute, and this convenient plan makes it easy for you to be a safe flyer and own a Switlik Safety Chute.

Just a small down payment and your chute is delivered...The balance you can pay in ten monthly payments . . No Red Tape . . . or long delay . . . Write or wire at once . . .

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Champion Aero spark plugs incorporate all the time proven advantages of all Champions which so definitely improve engine performance, and in addition are specifically designed for aircraft engines.

The unique dual insulators are so designed that they cannot be broken in such a way as to interfere with engine operation. Moreover being of exclusive Champion Sillimanite — not porcelain — Champion aero types offer the maximum heat range which is so necessary for safety and dependability.

Install Champions in your ship, and you will understand why Champions continue year after year to excel and outsell the world over.

Champion Aero A Exclusive Features

• 1. Restricted bore. 2. Special analysis electrode. 3. Secondary sillimanite dome insulator. 4. Welded steel terminal. 5. Copper seal. 6. Primary sillimanite insulator. 7-8. Modded Copper gasket seals.



## Champion Spark Plugs for Aviation

Spark Plugs for Aviation
Toledo, Ohio Windsor, Ont.



(Continued from preceding page)

plus a coordination of business to promote production, distribution and consumption. And we need them both.

We need them, I should say, rather particularly in the realm of aviation. The airplane is the outstanding necessity of national defense, and also the most promising prospect as a peaceful utility for the near future of business and industry. But how may the two plans be promoted for aviation without infringing on the theory that civilization should pay its way and not charge it to the children and their children's children?

The most immediate problem is that of war. How big an air fleet should we build and maintain to be ready for a real unpleasantness? Will ten thousand planes be enough, or fifty thousand?

The answer is that nobody knows. You may remember that Germany was more thoroughly ready for war in 1914 than any nation in history. But within a few months her armaments would have been exhausted, her ammunition shot away, her guns worn out and her reserve stores empty, if the factories of the Fatherland had not been mobilized at once to supply unlimited replacements. After the first big push, the war was fought with the weapons of peace, quickly converted to pugnacious purposes. And Germany came close to winning, though the world put a ring of steel and fire around her, because her industrial organization was superior to that of most of her enemies. A few blunders, a few heroic stands and desperate defenses, a few miscalculations gave the Allies time to match the German method of warfare, factory for factory and farm for farm, and at last to overwhelm her initial advantage.

We cannot possibly build enough aircraft now for the next war, whenever it may come. If we could, we couldn't pay for them; we should be obliged to charge them to the future. The same is true of battleships and big guns, which is what makes the Navy estimates look like such a nasty extravagance. The bill for the battleships which this nation has built and never used and the cost of maintaining them would pay off the depression and the war debts and leave something for Farm Relief. And that, if you care to know, is this nation's real complaint against the Europeans who stand with a tin cup in one hand and a machine gun in the other. They are maintaining armies and navies at wartime strength or worse, while they cry poverty and the high cost of living.

President Hoover is perfectly right when he says that this issue must be faced and settled. We should be prepared, moreover, to face it ourselves and take the consequences. During the last fiscal year we spent the neat sum of \$707.425,000 for armies and navies and things like that. The Soviet Union was runner-up, with a total of \$578,943,000, and France came third and England fourth. The world at large devoted a total of \$4,158,000,000 to preparing for war in times of peace, and that's a lot of money. The real and immediate problem of civilization is that it is entirely too much.

The answer lies in a proper plan for peace. Efficiency in modern warfare depends upon a quick conversion of peaceful strength to an emergency purpose. That, by the way, is how most of us manage our private program. I don't do my daily dozen before an open window because the wife may someday ask me to move the piano or throw a vacuum-cleaner salesman off the front porch. So far as I take any exercise at all, it is in order to keep fit for pounding the stuffing out of a typewriter and catching the morning train in twenty-three seconds flat. Thereby I acquire sufficient muscular development to push a perfect

stranger off my corns when they are stepped on in the

Preparedness for war today depends on efficiency in peace. We need, of course, a front line of defense which will take up the shock of the first attack. It should be a good front line, and the new Five-Year plan for Army and Navy aviation is no more than enough to provide it. But behind it and supporting it there must be a complete and coordinated system of commercial air transport, kept up to date by competition and kept ready for conversion to war by public use in peace. That sort of thing is what won the last war. There were no military railroads in England in early August of 1914. But two weeks later there were none others. There were few munitions factories there when the war began, but before long there was one that was nine miles long and lots of others. There were no transport cruisers until they were needed, when all the fast liners sprouted guns and put on camouflage. And when the next war comes, the winning Nation will be the one that knows how to fly and build aircraft, having learned the trick by attending to its aerial business in times of peace.

This is profoundly important, because it indicates the only way in which civilization can pay the price of preparedness for any threat against it. Overarmament is a disgrace to every decent instinct of humanity. This is admitted already and the whole world will some day be sure of it. Unpreparedness is no better. A man deserves no respect who cannot or will not stand up for his rights, and a nation does not deserve peace and prosperity which will not defend it. But common sense can compromise between excessive armaments and pacifism, and discover a solution for one of the most perplexing problems of our times. The solution is that a nation's real strength is its peace-time strength, measured not by idle guns and shells in storage, but by busy industries, organized and disciplined and experienced and ready for active service in every national need.

This sort of preparedness can pay its own way. It piles up no debts for somebody else and it spends a minimum of its man-power in useless exercises. It is the only sort of preparedness that a really civilized world will tolerate. It is the sort of preparedness that the United States is preaching to-day to Europe, where there are more men under arms today than there were in 1914.

It would be nice if the public could be persuaded to recognize the part that commercial aviation plays in our program of national defense. There would be less apprehension about the air mail deficit and a great deal more respect for the Department of Commerce and its aeronautical activities. There would be more pride in local airports and more encouragement for operators in their efforts to make a business profit. The success of commercial aviation would be taken on the public conscience, which is where it belongs.

And at the same time we should admit the importance of a principle which Mr. Hoover is trying to put across to the European neighbors and the folks at home—that there is no real civilization except that which is paid for C. O. D. No nation is civilized that puts its own people into economic slavery unto the third and fourth generation. No nation can buy honor with armaments which it charges to its children or pays for with the poverty of its people, just as no man is prosperous who lives in debt and dread of the sheriff. Civilization should be paid for by those who enjoy it. If they did so, they might learn to take better care of it.



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#### ANOTHER VANISHING AMERICAN

(Continued from page 44)

rect conclusion as to whether or not it is possible to fly to New York with any assurance of getting there. Then he has only about forty instruments, controls, taps, and other gadgets to occupy him as he flies, listening to the radio beacons-he's practically unemployed all the way. Of course, if the radio goes off-as it has been known to do on occasion-he merely has to make his way then by the visual beacons or by dead reckoning through or above the clouds. It is also desirable that he find the airport after flying 400 miles—the company prefers that he should—and naturally he must land and deliver the mail. After the radio landing beam is perfected, he won't even have to worry over a landing-the beam does that for him, while he glances over the evening newspaper. So you see, about all he has to do is to sit in the airplane until it gets there. Really, they should charge him for the ride.

Now, I know Bill and his background; I know something about the problems that will confront him on that flight; and I have the greatest respect for him as a highly proficient practitioner of an art where skill and long experience that have been translated into definite knowledge are essential if the practitioner would continue in practice. Hence I am prepared to grant at once that Bill is a professional man of high standing in a most intricate profession, where a lack of skill or lack of judgment may prove to be just as fatal as a lack of skill or judgment on the part of a surgeon performing a delicate operation.

Or, again, I glance at such pilots as Frank Hawks, Jimmy Doolittle, Wiley Post, or Al Williams—to mention at random four pilots who specialize in different phases of the art—and I grant at once their standing as professional men in a highly specialized profession. They have spent many years and many thousands of hours in the air colecting the experience that enables them now to do certain things that the majority of us are unable to accomplish at all—or at least not with the deftness and sureness of these gentlemen. If you asked me I should say at once that piloting was their profession.

On the other hand, you take me to an airport and show me a young gentleman sitting in a single-engined open cockpit plane engaged in the arduous pursuit of toting people around a two-mile circle in the air, and landing them again at the expiration of two minutes and two dollars. You inform me that the young man has been at this hard labor for some two years now and has piled up over a thousand hours in the air. He has not, however, flown any other type of airplane, except very occasionally, or has been more than a couple of hundred miles away by air.

Now, if you asked me, "Is he a professional man practising his profession?" I would reply, "In my opinion, he is a competent tradesman working hard at a somewhat monotonous but not especially skilled trade."

There has been so much rubbish talked and written on the subject of piloting as a profession, and on the nobility, heroism, and whatnot of pilots as a group that it is high time the cold water of common sense was thrown over the burning phrases to cool them off somewhat. The plain truth of the matter is that piloting the ordinary small commercial plane is not a difficult feat requiring skill of an order possessed only by the supermen among us. On the contrary, I am persuaded that almost any healthy young man who wants to fly and who can pass the Department of Commerce medical examination can be taught to handle the controls of a small airplane, take it off and land it perfectly, and fly cross-country for short distances at first,

and longer distances as time goes on and his experience accumulates.

I say "young man" because as a general rule it is only the comparatively young who learn anything easily and well, whether it is the practice of law or medicine or doing conjuring tricks. The old tend to grow petrified, mentally and physically. Hence the saying, "You can't teach an old dog new tricks." Even if you succeed, his joints creak as he essays them, Ralph Cram, Bernarr MacFadden and Charles Dickenson excepted.

No, flying an airplane around an airport in good weather is not much of a trick, and any healthy youngster who wants to do so may pick it up in short order. On the other hand, the bald statement that learning to fly is as easy as learning to drive a car is mere buncombe. It isn't as easy, and I doubt if it ever will be. There will always be another dimension to take into consideration.

This matter of whether piloting is a profession or a trade could be argued indefinitely, and a wide selection of instances, proving either side to be correct, could easily be adduced. I'm not taking the time to argue it, and I have given the above instances only to make plain my own thought on the matter, which is that it all depends on the pilot himself. I know of young men, without so many hours, who are exercising the brains and the talent required to make the expert pilot; and I know older pilots, with many more hours, who had thick heads or unsound judgment when they started, and who haven't improved with the years.

It's somewhat like the dental profession-a profession, unfortunately, with which I have had a great deal to do on the losing side. I've paid for almost as much bridgework as the railroad that runs to Kev West. And I have found that there are dentists and dentists, just as there are pilots and pilots. I've had graduate dentists working on me who were not competent to fill a ditch properly; and I've had others whom I knew were past masters of their profession. Likewise, I know transport pilots whom I would not permit to fly me from Roosevelt Field to Mitchel; and I know others with whom I would fly anywhere at any time. The one group are mere aerial tradesmen; the other group are professional men of high standing in their profession.

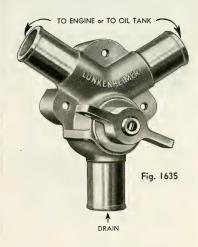
With this distinction that I have defined in mind, let us consider the position of the airline pilot, who almost invariably is a man highly skilled in the exercise of his profession. He has spent many years or much money, or both, in acquiring the technique that enables him to fly safely where the less capable might come to disaster. He may have collected his experience in the Army or Navy, or he may have gone to one of the thorough schools of the air and spent as much as \$7,000 on a transport course, flying a wide selection of airplanes. Then he may have flown privately, or for some commercial owner, and have piled up many hundreds of hours cross-country flying in all sorts of weather under all conditions of terrain. He has spent, we will say, the equivalent in time or money or both of what a professional man such as a doctor, a lawyer, or an engineer would have spent to fit himself for his profession.

In my opinion that man, whether young or old in years, has every right honestly to consider himself a professional man of recognized standing. He probably considers himself, and in my opinion is entitled to consider himself, in an entirely different class than the other pilot-who also has a transport license and many hours-but who has limited himself, or has been limited by circumstances, to a

(Continued on following page)

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type of flying confined within a very narrow range. Both are pilots—just as the expert dentist and the bungling dentist are both dentists—but what a difference there is in the two men! In fact, the difference is so obvious that I am not again going to refer to it, but am going to consider the problem now facing the airline pilot.

From the financial standpoint, his position is becoming steadily less desirable. Due to a variety of conditions which it is needless to discuss here—for the airline pilot is thoroughly familiar with them—the remuneration for his services is on the sliding scale, downward. If he could feel that this downward revision was due solely to the temporary financial necessity of the airlines, and that it would be rectified when conditions improve, or if he could even feel that further revision downward was not contemplated, the airline pilot, if flying on a well paying line, could rest tolerably content.

But, whether rightly or wrongly, the airline pilot does not believe that downward revisions already inaugurated will be the last. On the contrary, he feels that those already put in force are only the beginning, and that there will be others in the not too distant future. All of which, mulling around in his mind, tends to make him more than a little unhappy, more than a little worried about the future of a profession to which he may have devoted the best part of his life.

What, if anything, can he do about it? Not only is he worried about the subject of remuneration, but also about the conditions into which he sees the piloting profession falling, apparently naturally and inevitably. He sees-and I am quoting now a summary of the opinions of several airline pilots with whom I have talked-he sees the tendency on the part of many operators to hire young, inexperienced co-pilots, paying them a paltry salary, and then putting them to ride with the old experienced head for several years, where they may learn all the knowledge it takes to get by in bad weather. It is the firmly held opinion of the old pilots that the operators expect eventually to hire these co-pilots as first pilots, and at a scale of pay far below what now is generally paid. Whether this opinion is correct or incorrect, of course, is something that only time can tell. My own opinion is that the pilots have summed up the probable trend with great accuracy and perception.

I have discussed the matter with one airline executive who said, "The former high rate of pay was based on the admitted dangers of flying mail in bad weather. To-day that danger has been very largely removed. We have better airplanes, better instruments, radio communication, ground aids, that render flying the mail a simple matter and a safe matter, at least compared to the old days." In all of which, of course, he is right.

But that is no consolation or comfort to the old pilot who has endured all the dangers of the early days. He endured those dangers willingly, and faced them with the hope that eventually they would be overcome, so that he could make his living with a greater measure of safety at a profession that he had so greatly helped to build up. But he did not calculate that when, through his own experiments and the sacrifice of the lives of many of his friends, safety was approached, that the operator should say, "Well, flying is much safer. We shall now reduce the pay." It was his impression, all these years, that he would be building up the service and safety factors of airline operation to a point where he would reap a reward for the many dangers he had faced and helped to overcome. Apparently his impressions were somewhat over optimistic.

He notes also that some operators set an age limit of thirty years as being rather old for pilots they take on to work for them. Yet the experienced pilot, looking back on his own youth, his own flying experiences, knows that at thirty he is in the prime of life not only as a pilot but as a man. He knows that his physical condition is as perfect as it ever was—the Department of Commerce medical examination and the airlines' medical examinations assure him of that. But more important than that, he knows that he is now mature as to judgment, which he probably feels he was not at twenty-five, unless he was gifted with an exceptionally mature mind to start with. He not only feels that he is a more mature, safe, and competent pilot than he was as a younger man—he knows that he is, and so do all of those who know him well.

The experienced pilot, thinking over these things, does not fail to note that the general trend of airline hiring of pilots has been away from the old experienced pilot to the student, who knows practically nothing except what he has been taught. The expert pilot naturally feels that the motive behind this general trend is to put wages down, the reasoning being that it costs money to employ very experienced pilots, while young and inexperienced pilots may be hired for very little, taught free by the old head all that the old head knows, and eventually take his place at a greatly reduced salary. The pilot has not failed to note with disquietude that experienced pilots have been refused jobs as co-pilots, in favor of youngsters who had very little time in the air. The answer of the operator that it was necessary to train young heads for the business has not allayed the disquiet of the first pilot, for he feels assured that the co-pilot will never fill his shoes at his present salary. In fact, he believes that at some future time, when the young man is thoroughly trained, that he will be given the first pilot's job at a much lower rate of payand the first pilot may go for a walk.

Those, very briefly and sketchily, are the high lights of the airline pilot's picture. A book could be written on the spots the pilot believes should be touched up, toned down, or rubbed out altogether; and another book could be written about what the operator thinks is the matter.

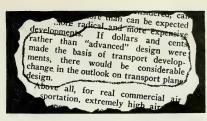
What is the pilot to do about it? Is he to take each salary cut sitting down? Is he to see his position undermined and do nothing about it? If he is, then he probably

deserves everything that will happen to him.

What, on the other hand, is the operator to do? But perhaps that is a useless question, for experience has proved that all employers do what seems best to them to do. Which isn't to say that what they do will of necessity be the wisest thing to do, even for their own well-being. But we may leave them out of the picture, with the understanding that they are business men with the backing of Capital—that magic feather bed on which employees also ride, until by a sort of devilish necromancy it sometimes changes into a club, and knocks them off! The operator is well-fitted to take care of his own interests, without my suggestions.

But the pilot—what of him? He is not a business man: if he were, he wouldn't be a pilot. He is a naturally adventurous, care-free fellow who through the years has taken on cares in the form of years of knowledge and a family. He has seen aviation change from a game into a business, and, unbusiness-like though he may be, he is smart enough to know that where there is business there is profit and loss. Right now he sees not profit, but loss, staring him in the face. Clearly, the next move is up to him. Nobody can help him but himself.

(Continued on following page)



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(Continued from preceding page)

The first difficulty that confronts the airline pilot is that he is personally unorganized to function as one of a group. He has been, and still is, an individualist. By now, however, he should be aware that the individual, working alone, may have many painful things done to him, and be unable to do anything in return. So his first thought should be to stop thinking so much about himself as an individual and start thinking about himself as one tiny unit of a large group of men engaged in occupations similar to his. In short, he should think collectively, not individually.

Then he should form an association of pilots who are doing the same sort of work that he is, so that all of them, collectively, may bring their thoughts and their strength to bear on any problem that presents itself. A Union? No, I should say not a union in the generally accepted meaning of the word. An Association, rather—an Association of Airline Pilots. And airline pilots only. Keep the rest of the pilots out of it—unless they are actively at work as airline pilots. At any rate, restrict the voting members to pilots actually employed on the airlines. When a pilot cases to be employed, he ceases to be a voting member. In that way the pilots actively flying may run the association to the best interests—or what seem to be the best interests—or what seem to be

However, in justice to the operators it should be remarked that some of the conditions of which the pilot complains are chargeable, not so much to the operators as to national and world-wide financial conditions. After all, who can say what is a just financial remuneration for any type of work? It must largely be dependent upon many conditions that vary from time to time For instance, suppose that I am a doctor who has been charging ten dollars a visit in 1929. My professional advice, I feel, has not deteriorated in value simply because the world is in a financial depression. I'm worth as much, I think, as I ever was. My clients, however, who also may agree that my services are worth ten dollars, now have only five dollars. Am I going to retire from practice simply because I can't get ten dollars-or am I going to take five and hope it doesn't slide down to three? I'd take the five, myself, with the mental resolution that if it went much lower I'd better find some other form of employment,

Now you may say that pilots already have two associations to look after their interests. Without discussing how well or otherwise those associations have functioned, I think it would be quite truthful to state that evidence of airline pilots being helped by those associations is almost negligible. Those associations are fundamentally unqualified to help the airline pilot solve his employment problems, if only for the reason that their membership is too varied. For example, pilots who now are operations managers, superintendents, or who are holding other executive positions with the airlines also are members of those associations. Those pilots of necessity are interested in their jobs, and not always in the problems of pilots who come under their jurisdiction. Could an airline executive, who is a member of the N. A. P. A., or the Professional Pilots Association, for instance, reasonably be expected to favor a course of action that might cause him trouble as an airline executive? His first thought is for himself as an executive-and if it isn't, he shortly will cease to be an executive and will be hunting a job himself.

Pilots must not overlook the dividing line that always has and always will separate employer and employee. I am a pilot. But suppose I start an airline, and hire pilots. Those pilots instantly become part of my expenses as an airline operator. If business is not good I must cut

my expenses-and the pilots, in my mind, will fall into the same chamber that holds all the other expenses. They may be brother-pilots, in theory; but in hard practice they are a part of my expenses, and if I am not making money they are part of the financial outgo that I must try to shave down-or go out of business.

Let the airline pilots organize, by all means. But let them not fix their minds too firmly upon the palmy days of 1929. Moderation is a very sane word that applies as well to pilots as it does to operators. I bought a pound of the best print butter the other day for 29 cents. Two years ago the same quality cost me 55 cents. I also have some stock in a safety deposit box. I used to classify it by its quoted value on the Exchange; now I classify it by the color of the certificates-I rate the pink ones first place, the green next, the purple next, and so on down the line, valuing it in my mind according to its esthetic appeal to

my visual sense. Why am I so interested in the well-being of airline pilots when I am not flying on an airline and never may be piloting on one again? Well, as I see the matter, piloting, carried to the perfection it has attained in the hands of our airline pilots, is a very fine profession and one whose traditions and well-being are well worth guarding. As an old pilot who may or may not fly again commercially I don't like to see piloting, now that our old game has become a business, degenerate into a sort of glorified bus driving.

#### SAFETY FOR THE LIGHT AIRPLANE

(Continued from page 48)

centrally placed, are of some advantage, yet considering the fact that in landing pilot and passengers frequently have their heads cocked to one side, the full width crash roll manifestly is superior. No sharp corner should appear in any cockpit, and gadgets such as switch levers may easily be shielded by being placed below and slightly forward of a smooth surface, such as the instrument board. Similarly all fittings, clips, horns, door handles, etc., in the cockpit should be designed and located with this crash hazard in

Control members should be removed from the cockpit whenever possible. If an underslung stick unit is used, the lowest point may well be a bend, as illustrated, and the foremost position of the stick slightly in front of the dash, thus offering no resistance to the pilot's forward lunge. In the case of a wheel control, the large bearing area of the rim is a distinct advantage, assuming of course that the latter is attached to spokes and shaft with sufficient rigidity.

In designs which include roll bracing in the form of struts or wires, above the dash, care should be taken to place these members a reasonable distance forward of the crash roll. A better way is to eliminate such members entirely.

In short, if a designer will make a practice of placing himself in numerous ships, assuming at the same time that he is soon to crash, he will have little difficulty in locating numerous menaces to his health and well-being. Thereafter he will perhaps more fully appreciate the necessity for eliminating all ugly protuberances and of providing smooth surfaces and padded edges as the points of contact.

The problem of protecting occupants from the effects of buckling structure members should be investigated from two angles. In the first instance a longeron, strut, seat support or other member may buckle and either injure or pin the occupant. In the second case the buckling of one or nore members may jam doors or hatches sufficiently to (Continued on following page)

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(Continued from preceding page) prevent rapid egress.

In light planes, and particularly closed models, the designer frequently finds structural members lightly stressed in relation to their lengths. Adequately strong for maximum flight loads, they are wholly inadequate for withstanding normal crash stresses. A few pounds added to such cockpit or cabin structures may easily prove to be a very worth while investment.

Many pilots and designers appear to harbor the misconception that when a ship is nosing over on landing it is an easy matter to "rig in the head." As a result, the probable effects of this uncalled-for maneuver are frequently underestimated

It is not at all difficult to visualize what transpires when a ship noses over due to landing with brakes locked, or more frequently, to striking very soft ground or some low obstruction. If the ship goes over slowly, the pilot may feel no ill effects other than the momentary discomfort of hanging out against his safety belt in the inverted position. In an instance where the ship goes over fast, however, centrifugal force will tend to draw the pilot backward and generally outward, which has been proven by accidents in which pilots not belted in were forcefully ejected from their seats. Assuming the presence of a safety belt, then, it is evident that the pilot will be hanging out of the ship in the upside-down position. Should the ship under consideration be a type that, after nosing over, will rest upon the pilot's head and the rudder, due to the absence of any structure above the cockpit, the pilot will usually be found in a bad way. In this position the pilot's neck may be called upon to take ninety per cent of the load, to the rudder's ten, which brings to light another oversight on the part of Mother Nature. At least that is a possible design viewpoint.

A better way out of this difficulty lies in designing a suitable cabane or center section structure above the cockpit, to withstand a sizeable impact load without buckling. In this investigation a ground component should be included, since it is possible for a ship to go over fast enough to skid along the ground in the inverted position. Here again the designer should assume that the pilot's head will strike the superstructure, and proceed to eliminate wires, sharp fittings, etc., and to make free use of padding-which. after all, does not weigh nor cost very much.

The rapier strut is a frequent offender in accidents of "freak" variety, and injuries due to this cause are chargeable entirely to errors in design. Figure 4 illustrates the manner in which careless design may provide persistent threats to the pilot's safety. Misplaced struts, like poised rapiers, are aimed at vulnerable parts of the pilot's anatomy and frequently only an otherwise inconsequential crash is needed to set them free to go about their business. Although the shock and radius struts of the undercarriage are the most frequent offenders, one occasionally observes wing, fuselage and even control members which could be relocated to great advantage. If the design includes pontoon gear, the changes in angularity of the support struts should be taken into account. Seat supports are another source of injury and may be studied to advantage.

The rapier strut can be entirely eliminated by so locating structural members which may be subjected to high compression loads in a crash that they will thrust away fromnot toward-the pilot; certainly not in the direction of a vulnerable part. Another safeguard to prevent injuries from strut end-thrusts lies in designing the couplings of these members well above the buckling points of the struts,

king into account the fact that in crashing a strut connecon may be subjected to a high wrenching, or torsional ad, in addition to a compression stress.

Surprise attacks are always the most dangerous and degners should see to it that pilots are not bothered by the

otential dangers due to misplaced members.

Figure 5 illustrates a hypothetical undercarriage design which the entire vertical loads go into the ship through e shock struts. Frequently, in cases of this sort, a degner will find that he can play stress components against ich other to gain a definite safety advantage. In this inance the shock strut induces tension in the axle-radius rut vee, of sufficient magnitude to offset the alternate empression loads in these members in two-point and threepint landing conditions. The final result is that axle and dius strut are kept in tension except in an instance of an onormal side-load landing. The possibility of a large inound load here is offset by the presence of the wings, hich probably would prevent the undercarriage striking the required angle.

The one sure way to eliminate rapier struts lies in degning the structure around the occupant-not in placing ne occupant in the structure, as frequently happens.

Another source of injury clearly attributable to faulty esign may occasionally be found in weighty objects located pove and behind the occupants, and inadequately anchored. Ithough the power unit in a pusher is the foremost exmple, we must not overlook the fact that a storage battery, eavy piece of luggage, fire extingusher or other object ay do damage in a crash if improperly located and weakly ttached. A battery should also be studied from the angle f its acid effects.

Figure 6 illustrates a pusher type striking the ground at steep angle-such as might result from a stall in a care-

ss take-off.

Let us assume that the ship strikes hard, yet not with ufficient force to cripple the pilot. It is immediately aparent that the powerplant load must be carried through he structure to the point of ground contact, possibly as idicated by the dotted lines, with considerable strength, if he engine is to remain in place and not dislodge and pin own the pilot. However, we occasionally observe instances where the structure evidently has been designed solely from he viewpoint of flight stresses, without apparent thought f the crash hazard. Member X, for example, may be alled upon in a reasonable crash, to take several times its naximum stress in flight. Should these members buckle is plain that the power unit will fall upon the pilot. Obriously, though, there must be a complete follow-through etween the weight in question and the point of ground ontact. How rugged this structure should be is problemtical, depending principally upon the intensity of the shock hat the pilot can withstand. Certain it is that normal flight tresses are woefully inadequate for the crash condition.

Similarly, the nose section of the fuselage requires attenion if the pilot is not to be crushed due to its collapse. In hort the designer should, theoretically, stand the ship on ts nose, and rotate it through to level landing position, all he while observing the relation of the posed weight to the ccupants' positions, thereafter proceeding to carry the load n crashing around the seats, not permitting it to act directy through them. The poised weight probably constitutes he most serious sales resistance to the pusher type. The addition of some structural weight may readily overcome his obstacle in a legitimate manner.

Fire hazards are traceable to two sources: persons and (Continued on following page)

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(Continued from preceding page)

powerplant. In the former instance the fireproofing of cockpit and cabin interior materials, together with well-designed and placed smoking equipment and a hand fire extinguisher is the best that can be done. But the very large majority of plane fires are due to the engine.

The sources of engine fire are the carburetor air intake, the magnetos, very hot parts of the engine and the exhaust stacks. The Diesel engine will eliminate all but the last of these. In many ships inadequate fire prevention renders very high flying, without chutes, particularly unpleasant.

Assuming a gas engine, let us examine first the possibilities of taking afire in flight. Probably the most prominent cause of fire is to be found in poor fuel line connections. A leak may fill the engine compartment with fumes or the gasoline may drip down upon the cowl and thus flow backward and out upon the underside of the fuselage, where a backfire from the carburetor may ignite the ship in its most vulnerable spot.

The former type of fire can be prevented by adequate ventilating louvres in the cowl; by sufficient roominess in the compartment and the provision of an auto type hood for easy inspection and cleaning. An automatic or remote-control extinguisher in the engine compartment is a worth while, though expensive, accessory. It is assumed that the firewall is sealed tightly around the control and fuel lines, tachometer shaft, etc., by suitable grommets.

Numerous means are available to the designer toward minimizing the fire hazard at the lowest firewall point, due as a rule to a leaking fuel line. Bending the firewall backward near its lowest point to facilitate draining, and providing a small residue well in the cowl at this point, are worth while considerations. The drain vent should be carried rearward and away from the carburetor air intake as far as conveniently possible. Moreover it is better to have a strip of cowl back of the drain than doped fabric.

But the speediest way to eliminate fires due to a carburetor backfire's igniting the ship at the drain point, lies in altering the design of the engine so that the carburetor air intake protrudes from the side of the ship rather than from the bottom. It is quite necessary to have the drain on the underside and in back of the carburetor, whereas the carburetor air intake may be easily relocated. Assuming it is changed to a side position, and a flame-deflecting shield riveted to the cowl below it, a very important source of fire danger will be eliminated. Likewise the cowling should fit snugly around the air intake, to prevent the flame from backing into the engine compartment. But the most important consideration lies in the provision of simple, reliable and tight fuel line connections near the engine.

Preventing fires igniting by the exhaust is principally a matter of locating the exhaust stacks sufficiently far away from inflammable parts of the ship, particularly doped fabric. Air spaces between exhaust stacks and parts of the ship should be generous and the designer may well consider the probable position of an exhaust manifold after assuming that its support has let go due to vibration. If he finds that the manifold will then rest on a highly inflammable surface, he is in a better position to do somthing about it than a luckless pilot would be.

Crash fires usually result from breaking fuel lines or bursting tanks and both problems are entitled to much serious study. Undoubtedly the ideal combination is gravity feed from tanks located in the wing panels. The center section is not a very good location as anyone who has had a gasoline shower bath after a crash fully understands. If

the tank is located in the center section, or in the fuselage just behind the firewall, it should be, preferably, of crashproof construction.

The danger due to ground fire may be reduced by making the hand fire extinguisher readily accessible from without the cockpit as well as from within. It is reasonable for a designer to assume as a working basis that his plane will be carelessly maintained and will crash, leaving the occupants stunned. Thereafter he will proceed to eliminate faulty features of design that have been the causes of numerous fires in the past.

Aeronautical engineers can prevent many accidents—but ty no means all. Their aim therefore should be to prevent injuries.

#### TRANS-ATLANTIC AIR MAIL

(Continued from page 39)

systems travel from the west thus giving more up-to-date information to the eastbound pilot; third, inaccurate navigation can make little difference in the time of a landfall going toward Europe, whereas on the westward journey it may add many hundreds of miles before land is reached. Therefore, it is desirable to consider the problems of the more difficult direction, east to west.

Comparing the trans-Atlantic air route with the ordinary steamer run from Plymouth, England to New York, the following are the principal routes to be examined:

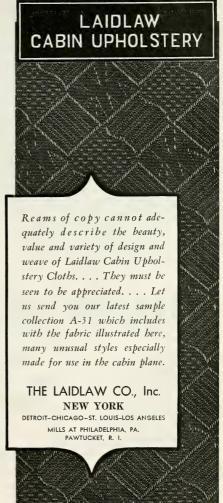
| 1. | Route Plymouth-Valencia, Ireland. Valencia-Newfoundland Newfoundland-New York | 1,900 |
|----|-------------------------------------------------------------------------------|-------|
| 2. | Plymouth-Azores                                                               |       |
| 3. | Plymouth-Azores Azores-Newfoundland Newfoundland-New York                     | 1,360 |
|    |                                                                               | 3,910 |

#### 4. Northern route, via Iceland and Greenland.

The first of these is shorter in distance than the others by several hundreds of miles. On the other hand, the single hop from Ireland to Newfoundland is in an area of almost constant adverse winds of appreciable strength which increase the effective distances very seriously. However, conditions for the take-off at Valencia are very good so that an efficient plane can take a greater load off the water.

The second route is the one which is generally proposed but which has certain serious difficulties. As I have said, the sea conditions at Horta are far from being always favorable for a take-off with a very heavy load. Yet on the east to west journey there is the great distance of 2,060 miles to be covered to reach Bermuda. Winds on the route to Bermuda are retarding winds a great part of the time, although they are not usually of the same strength as on the more northerly routes. And it must be remembered that operations must be based on the worst of normal conditions.

The third route, from the Azores to Newfoundland, is a (Continued on following page)



Yards of Satisfaction

(Continued from preceding page)

much shorter journey but, on the other hand, it goes into the area where more and stronger adverse winds are likely

to prevail.

It is of great importance to compare the advantages and disadvantages of the two hops, Azores-Bermuda and Azores-Newfoundland, in connection with the adverse winds to be encountered. In the first place, especially in bad weather conditions, adverse winds on this route are westerly or southwesterly. Whereas these would be direct head winds on the Azores-Bermuda route, they would be practically beam winds on this route. Their adverse force, therefore, would not be as great as if they were direct head winds.

If, for example, the cruising speed of the plane is 100 miles per hour, it will take twenty and one-half hours to reach Bermuda in still air. To cover the distance to Newfoundland a plane of the same range would need to average only sixty-six miles per hour. This means that it could face a head wind of thirty-four miles per hour the entire way to Newfoundland and still reach there, requiring no more fuel range than it would ned to go to Bermuda in calm air. Further, calculations show that if the cruising speed were 125 miles per hour, it could face a gale of forty-two miles per hour all the way and still reach Newfoundland. At 150 miles per hour it could reach Newfoundland against a continuous wind of fifty-one miles per hour. In actual fact, no such conditions would ever be liable to arise, and any westerly winds over the Newfoundland route would mostly indicate at least some westerly wind over the Bermuda route. Thus under all reasonable conditions a plane which had barely enough fuel to reach Bermuda could reach Newfoundland with fuel

to spare. The result of these figures is to show that on the Newfoundland route a smaller fuel range would be needed, and therefore a larger payload could be carried, making the Newfoundland route a more economical undertaking.

The other advantages of the Azores-Newfoundland route are many. This jump crosses the main trans-Atlantic shipping lines. This means greater possibilities of assistance if the ship were forced down, more assistance by way of general information from the radios of the ships on those routes, and, above all, more accurate knowledge of the weather due to this information.

This consideration of following main shipping lines touches a subject of great future interest. Along with other students of flying boat operation, I have held for a long time that the flying boat will one day form an important adjunct to shipping. For this reason I advocate combining as closely as possible the operation of flying boats and shipping. I deprecate any operational developments tending to differentiate flying boats from shipping, especially over open-sea routes, by such provisions as separate customs arrangements, separate radio frequencies, and the like. In my own attempts at trans-Atlantic flying, I tried to operate exactly as if I were merely a high-speed ship and met with extremely successful results.

There remains to be considered the much more northerly route by way of Greenland and Iceland. On the Plymouth-New York run this adds very appreciably to the total distance. On the other hand, it has the advantage of frequent assisting winds to the westbound plane together with the possibility of reducing hops to not more than 500 miles. For journeys between German and Northern Europe to points such as Chicago, the distance is very materially re-

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duced by taking this route. Apparently, also, weather over this route is no worse than that over which the air mail flies regularly in this country. At the present moment the principal disadvantage of this route is relative inaccessibility

for servicing, supplies and assistance.

The consideration of the foregoing facts seems to show that the Azores-Bermuda route has not the unqualified advantages that seem to be assumed. We must concede at least four or five years before even a summer service could be regularly and effectively operated over the North Atlantic. Unquestionably, during this period bad weather will become far less of a disadvantage and the governing factor will be the length of the hops which, in turn, will govern the payloads that can be carried.

My own guess is that nothing but purely experimental flying should take place for the first two or three years; that then the outward route should be by way of Newfoundland and Ireland and the return route by way of the Azores and Newfoundland. Later on as ranges increased, the outward route should be the same and the return route might be from Ireland to Newfoundland or, when better communications have been established, by way of Ireland.

#### 1931 NATIONAL AIR TOUR

(Continued from page 42)

At the time there was talk of protests on other rulings of the technical committee, and it remained to be seen whether the feelings expressed by various pilots would take the form of actual protests when the tour finally terminated at Detroit.

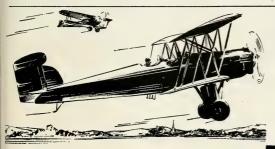
Lancaster's Bird, Stinson's Junior, Gehlbach's Bird, Schneider's Cessna, Meehan's Great Lakes and Dickson's Aeronca were scoring in order below Story at the time this point was raised.

All around the circle the towns that were visited agreed that the coming of the Tour planes stimulated interest in aviation and made better airports and more flying probable. The route had been selected, apparently, with a view to promoting interest in several cities which had airports that were none too good. It carried the planes into the eastern mountains where landing fields are hard to make and even some of the cities are hard to find; and it was at these places that the pilots had their troubles.

#### Around the Circle

Canadian fliers, on a good will tour of their own, were at Walkerville, a fifteen-mile hop from Detroit, when we paused for luncheon on July 4. Then a 260-mile flight took us to LeRoy, N. Y., one of the most air-minded small towns in the country. The big hangars hold an amazing assortment of planes and several gliders-for here Hawley Bowlus runs the gliding school, while Russell Holderman manages the field and flying school. Donald Woodward, of Jello fame, is the answer. He owns the airport and is in everything else. Mountains of clams, lobsters, 'n'ev'rything made the clambake in the woods that evening a red date

At Bradford, Pa., they shot an oil well for us to show where Doc Kinkade got the Kendall oil he was furnishing the tour. To get into an argument with those Pennsylvanians, just suggest that some other base for lubricating (Continued on following page)



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(Continued from preceding page)

oils may be as good as the oil they get out of "them thar

At Wheeling, W. Va., they had to welcome us on a landing field over in Ohio. Among these hills good landing fields are few and far apart and what they have are mainly narrow ones alongside the rivers, like those the tourists found at Pittsburgh and at Wheeling, and like the one below Wheeling at Moundsville. Wheeling citizens voted down a bond issue, needed to grade a field on their side of the river. and welcomed the tour as a possible stimulant to the public imagination.

If these citizens would all take a cue from Fred M. King their air-minded millionaire, they would do big things. Mr. King owns a Bellanca Airbus, and George Haldeman is his personal pilot.

"We were looking for rough country, and we surely found it," commented Ray Collins, tour manager, after the over-mountain jumps to Huntington, W. Va., Middlesboro, Ky., and Knoxville, Tenn. By the time we were down there close to the Smokies, more than one pilot had received the three salaams and the razzberry that were the rest of the crowd's satirical tribute to his navigational prowess.

Stops at Murfreesboro's big airport, and Memphis, Phoebe Omlie's town, were followed by landings on the big airports at Birmingham and Montgomery, Ala. Luncheon at Gulfport, and then the Battle of New Orleans. The tour broke the drought at Shreveport and Houston, and gave them a cloudburst at Corpus Christi. Jack Baretta and his helpers made the San Antonio stop a pleasant one. Then came the two-day stop at Fort Worth, while all the storm-tossed contingents caught up, and the tour headed north with ten contestants on the line when "Pop" Cleveland called the seconds and Ray Brown waved the starting flag. Kansas City, Lincoln and Omaha were night stops. and the tour planes reached Davenport after their longest flying day-hops of 118 miles to St. Joseph, Mo., and 253 miles to Davenport. Akron later gave them a chance to see lighter-than-air stuff, and three weeks of flying and banqueting and plane selling ended at Detroit on the 25th.

#### Eddie Demonstrated 'Em

Speaking of plane selling, you should have seen Eddie Stinson on this tour. He was flying a Stinson, Jr., in competition, but gave it about as many hours in demonstration flights as in the tour proper. He was hardly landed until he was up again, with his cabin full of business men who are prospective plane buyers. Up 1,000 feet or so, he says to whoever is seated beside him, "take a hold there and fly it yourself." And usually they do, and find it easier than driving a car. Eddie was using the tour just as it should be used—as a great sales promotion opportunity.

#### Bill Stout Gets Serious

At Detroit I had found William B. Stout and Ralph Upson flying the new Sky Car, and discussing what improvements could be made in it before it goes into production next spring. Mr. Stout came along with the tour as far as Columbus and was always ready with a Swede story, a piano solo or whistling obbligato to add to the post-banquet fun. At Wheeling he became serious and made the best speech of the whole tour, on the safety of air transport.

#### The Official Staff

Major "Jimmy" Doolittle as referee headed the interesting personnel with Manager Collins. "Pop" Cleveland was starter again, and Ray Brown, assistant starter; Walter Lees, chief timer; Tom Colby and Doc Kinkade, assistant

(Continued on following page)

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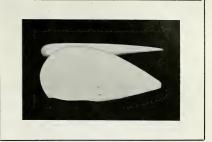
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timers; Frank McKay, operations manager; E. P. Crocker, scorer, and Ralph Young, assistant scorer.

All worked hard to make the tour a success. Valuable also were the accompanying planes and their pilots: the Shell Lockheed flown by Jimmy Doolittle, the Cleveland Pneumatic Tool Company's plane flown by "Pop" Cleveland, the Diesel Waco of Walter Lees, the Berry Brothers Laird, the Kendall Bellanca flown by R. E. Drake, the Wright service ship, a Stinson, Jr., flown by Leon Allen, and the Pratt and Whitney Stearman, Bill Gould, pilot, and others that were with us from time to time. These included Mr. King's Airbus which George Haldeman tied in with the tour for several hops.

Shreveport had half a hundred army planes to take part with the tour in dedicating the new municipal field there. They were celebrating, too, the proposed location of the Third Attack Wing at Barksdale Field, near the airport which was dedicated.

Captain Yancev made the round of the tour as a pilot of the Champion Spark Plug Company's autogiro which was easily the hit of the tour from the standpoint of public interest. The Gee Bee planes were a close second, Z. D. Granville of Springfield Mass., their designer, accompanying the tour in a Wasp-powered Senior Sportster with Mrs. Granville in the passenger cockpit. Lowell Bayles flew the Warner Junior Sportster in competition and gave the crowds some thrills by his demonstrations of the bigger one at the various stops.

Manager Zach Miller of 101 ranch handed his five-gallon hat to one of his cowboys and climbed into the autogiro for a ride after 101 had served a chuck-wagon lunch to the tourists at the Ponca City stop.

From New Orleans north the tourists carried rain to almost every city they visited, Corpus Christi having a cloudburst, Ponca City another, and Kansas City a downpour of rain that made the visibility on landing almost nil.

On such a trip one meets in all parts of the country many business men who are flying their own planes. When Lowell Bayles' motor went haywire in Alabama, it was Dr. W. W. Webb of Opelika, Ala., who offered him at once the engine in the Waco he had flown to Montgomery to meet the tour. Former Mayor L. M. Atkinson of Pittsburg, Kans., flew his own Monosport to Ponca City to meet the tourists. Arthur Hargrave, president of the City Ice Company at Kansas City and of Inland Aviation Company and many other concerns, flew 272 hours in the first twelve months since he got his private license.

Omaha almost lost its place on the schedule until Bernie Wickham, millionaire Council Bluffs aviator, and City Commissioner Dean Noyes got busy at the last moment and organized an impromptu reception.



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| Archibald Williams\$2 CONOUEST OF THE AIR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                  |
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| PILOTS' LUCK.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | E                |
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| STRATEGY AND TACTICS OF AIR FIGHT-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | H                |
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| ELEMENTARY (General)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| A B C OF AVIATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| A B C OF GLIDING AND SAILFLYING.  Major V. W. Pagecloth, \$2; paper \$1.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| AEROBATICS. H. Barber                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| BOOK OF THE AEROPLANE.  Capt. J. Lawrence Pritchard\$3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| DICTIONARY OF AERONAUTICAL TERMS. S. Vanier (German, English and French).\$1.65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| ELEMENTS OF AVIATION.  Virginisis Evans Clark                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Albert P. Thurston, D. Sc                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| J. B. Hart and W. Laidler \$2.50<br>ELEMENTARY LABORATORY AERODY-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| EVERYBODY'S AVIATION GUIDE.  Maj. V. W. Page. \$2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| EVERYMAN'S BOOK OF FLYING. Orville Kneen\$3.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| Ralph Stanton Barnaby\$3.00<br>HOW TO FLY. Barrett Studiey\$3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| HOW TO FLY AN AIRPLANE.  Percival White                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| IF YOU WANT TO FLY.  Alexander Klemin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| MODERN AIRCRAFT. Major V. W. Page\$5<br>MODERN AIRPLANE. Bertram W. Downs\$1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| MODERN FLIGHT. Cloyd P. Clevenger\$1 PRACTICAL FLIGHT TRAINING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| PRACTICAL FLYING. Byron Q. Jones\$3 SIMPLIFIED AERODYNAMICS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Alexander Klemin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| SKYWAYS. General William Mitchell                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| THE AIRPLANE. Frederick Bedell\$3 THE ART OF FLYING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| J. B. Hart and W. Labiller 22.50 ELEMENTARY LABORATORY AE 22.50 ELEMENTARY LABORATORY AE 22.50 ELEMENTARY LABORATORY AE 22.50 EVENYBODY'S AVIATION GUIDE 22.50 EVENYBODY'S AVIATION GUIDE 23.50 EVENYBAN'S BOOK OF FLYING 32.50 EVENYBAN'S STANDAY 32.50 EVEN                                                                                                                                                                                                                                                                                                                                         |
| AIRPLANE STRESS ANALYSIS.  Alexander Klemin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| ELEMENTS OF AEROFOIL AND AIR-<br>SCREW THEORY. H. Glauert \$5.60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| FOR AIRCRAFT DESIGNERS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| AIRPLANE STRESS ANALYSIS.  AIRPLANE STRESS ANALYSIS.  AIRPLANE STRESS ANALYSIS.  AIRPLANE STRESS ANALYSIS.  AIRPLANE AIRPLANE AIRPLANE AIRPLANE AIRPLANE CARREST.  AIRPLANE CARRES MODERS.  AIRPLANE CARRES MODERS.  AIRPLANE CARRES MODERS.  AIRPLANE CARRES MODERS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| ENGINES A SOURCE A SOURCE AND A SOURCE AS                                                          |
| PRACTICE. J. B. Rathbun\$2.50 AIRCRAFT ENGINE INSTRUCTOR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| ARCRAFT ENGINE INSTRUCTION.  ARCRAFT POWER PLANTS. E. T. Jones.  R. Instey. F. W. Caldwell and R. F. Kohr. \$4.25  AVIATION ENGINE EXAMINER.  Major V. W. Page.  \$3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| AVIATION ENGINE EXAMINER.  Major V. W. Page                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| AVIATION ENGINE EXAMINER.  Mojor V W. Page.  AUTOMOBILE AND AIRCRAFT ENGINES.  AVIATION CHART. Lt. V. W. Page.  DIESEL AND OIL ENGINEERING HAND.  BOOKN J July Robbom.  BOOKN J Page.  BOO                                                         |
| DIESEL AND OIL ENGINEERING HAND-<br>BOOK. Julius Rosbloom.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| MODERN AVIATION ENGINES.  Victor W. Page (2 volumes), per volume\$5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| MODERN DIESEL ENGINE PRACTICE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| THE TESTING OF HIGH SPEED INTERNAL COMBUSTION ENGINES. A. W. Judge. \$7.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| ABOVE THE BRIGHT BLUE SKY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Elliott White Springs                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| James Warner Bellah                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Lawrence La Tourette Driggs\$2.00 SKY LARKING. Bruce Gould\$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| ABOVE THE BRIGHT BLUE SKY.  Ellioti White Springs . \$2,50 CONTACT. Ellioti White Springs . \$2,50 GODS OF YESTERDAY.  """ \$2,50 GODS OF YESTERDAY.  "" \$2,50 GODS OF YESTERDAY.  "" \$2,00 SKY LARKING. Bruce Gods.  \$3,00 SKY LARKING. Bruce Gods.  "" \$2,00 SKY LARKING. SHE STORIGHT.  " \$2,00 SKY LARKING. SHE STORIGHT.  "" \$2,00 SKY LA |
| HISTORICAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| John Goldstrom                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| A NARRATIVE HISTORICAL  A NARRATIVE HISTORY OF AVIATION.  John Goldstrom  BOYS LIFE OF THE WRIGHT BROTHERS.  Witchell V. Charnley  EVOLUTION OF THE FLYING MACHINE.  Balloon: Airship: Aeroplane.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Harry Harper\$5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Kajari Jaryani-Itonana                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
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|   | JAPA<br>PA         | N, THE                                  | AIR MENACE OF THE Jegierson Davis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|   | Lie<br>SEVI        | GHTS OF T<br>ut. Lester J.<br>EN SKYS.  | HE AIR,  Maitland\$3.50  H. F. Guagenheim\$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|   | SKY                | HIGH.                                   | nd F. Alexander Mogoun. \$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|   | W.<br>BEGI         | Jefferson D<br>INNINGS O                | WINGS. \$2.50 F ORGANIZED AIR POWER. \$7                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|   |                    | *                                       | NOTOTIMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|   | H.                 | CRAFT INS N. Eaton an SUREMENT ESSURE.  | TRUMENTS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|   | PR                 | ESSURE. LANDING                         | TRUMENTS.  d Other Specialists                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|   | AIRE               | ORTS AND                                | AIRWAYS. Donald Duke \$5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|   | AER                | ONAUTICAL<br>Jefferson De               | LAW.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| ) | AIRC<br>Jan        | CRAFT AN<br>nes M. Spai<br>CRAFT LAV    | FIELDS AND AIRWAYS  AIRWAYS Donald Dale. 35  LAND MEDICAL  LAW.  510  COMMERCE IN WAR  100  COMMERCE IN WAR  100  COMMERCE IN WAR  100  100  COMMERCE IN WAR  100  100  100  100  100  100  100  1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|   | AIR                | POWER AN                                | D WAR RIGHTS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 1 | LAW                | TION LAW<br>OF AVIAT                    | I. Henry G. Hotchkiss\$7.50<br>ION. Rowland W. Fixel\$7.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| ) | THE                | LAW IN                                  | RELATION TO AIRCRAFT.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| 3 | U. S               | AVIATION                                | N REPORTS\$10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| i | Lo                 | uis H. Bauer                            | M.D\$7.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| ) | MAN                | UFACTURE<br>D GLUE.                     | AND USE OF PLYWOOD                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|   | MET                | ALLURGY<br>NUM ALLO<br>INEERING         | OF ALUMINUM AND ALU-<br>YS. Robert J. Anderson\$10<br>MATERIALS (VOL. 1)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| ; | FE                 | RROUS. A.                               | W. Judge \$8.50<br>MATERIALS (VOL, II)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| ) | ENG                | W. Judge<br>INEERING                    | MATERIALS (VOL. III)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| 3 | A.                 | W. Judge                                | MATERIALS  2. AND USE OF FLYWOOD  3. C. Boulton. ALL  3. AND USE OF FLYWOOD  3. ALL  3. AND USE OF FLYWOOD  3. ALL  3. AND USE OF FLYWOOD  MATERIALS  MATE |
|   | AER                | ONAUTICA                                | L METEOROLOGY, (Revised                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 5 | A CI               | OUD ATLA                                | KETEOROLOGY (Revised STORM STO |
| 7 | CLO                | vold Lewis P<br>UD STUDIE<br>CE OF THE  | S. A. W. Clayden, N. A\$6 WIND. Herbert Chatley\$2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| 3 | MAN                | AND WEA                                 | THER. Alexander McAdie\$2 FOR AVIATOR AND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| 3 | WEA                | THER E                                  | E. Free and Travis Hoke\$3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| } | DEC                | MO                                      | DEL AIRPLANES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| ) | BUII               | DING AND                                | FLY. Merrill Hamburg. \$2.50<br>FLYING MODEL AIRCRAFT.<br>arber. \$2.25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| 5 | MIN<br>AND         | IATURE A<br>FLY THE                     | srber. \$2.25 IRCRAFT, HOW TO MAKE M. and Terence Vincent80c                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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#### ARCHITECTURAL PRINCIPLES APPLIED TO AIRPORT DESIGN

(Continued from page 36)

these. It is an attempt to idealize the whole scheme, to unify, simplify and make orderly all the complex requirements of the airport.

Of course, the picture I have given here of the problem of the airport is based upon our present conception, which is, after all, not much further advanced than thinking of the airport as something similar to a railroad station. What it will be in the future is impossible to predict, for we must advance by degrees. It is certain, though, that in the light of the experience we have had with railroad stations, we can predict that every airport will be a brand new problem with new conditions to solve and new technical advances to be used. Therefore, to attempt to develop fixed standards for design is a waste of energy. New technical facts will always be developed by engineers, and architects should be called in to coordinate and humanize them.

Since we must admit that one of the grandest achievements of the human race is its newly acquired power to fly, then no airport is worthy of its existence if it does not express in its form the poetry of this great event. The railroad stations in our great cities have become the symbolic gates to distant lands, and the designs, good or bad, made by architects have tried to embody this thought in the entrance and in the majesty of the waiting rooms. But what about the airport? Will it not in the future have a greater significance to the community, a greater thought to express and so call for grander architectural poetry than has ever been built for railroad terminals? It will, if by that time we have not allowed the mechanical toys we have built to crush out the poetry from our souls. There are danger marks on the horizon now. There are some who claim that to solve function is all that is necessary. There are others who say that the days of story-telling in architecture are over, that all buildings have essentially become machines-cold, inhuman, efficient, doing their work with precision and speed. Let us hope, though, that the builders of airports will have a bigger vision than this, that engineers will realize that with human beings there is a spirit as well as body that must be satisfied. And that they will be willing to cooperate with architects to make these places of embarkation into the skies worthy of the great science of aviation.

(The foregoing article is from a paper prepared for the annual convention of American Society of Mechanical Engineers, Aeronautic Division.)

#### AIRCRAFT FINISHES

(Continued from page 49)

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#### SPARK PLUGS

B. G. Corporation Champion Spark Plug Company

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Goodrich Rubber Company, B. F. Goodyear Tire & Rubber Company

#### TOOLS AND HARDWARE

Ex-Cell-O Aircraft & Tool Corp. Norton Company, The

#### TUBING

National Tube Company

#### UPHOLSTERY

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Pictured in the narrow panel above are some of the 95th Pursuit Squadron's Wasppowered Boeing planes, flying at 18,000 feet. The lower illustration shows a group of pilots of this famous organization dressed for an altitude flight over Rockwell Field.

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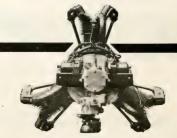
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| Bore                                        |
|---------------------------------------------|
| stroke                                      |
| Piston displacement 160 cu. in.             |
| Compression volume ratio 5 to 1             |
| R.P.M                                       |
| H.P50                                       |
| Weight with exhaust stacks 156 lbs.         |
| Weight per h.p 2.5 lbs.                     |
| Fuel consumption-cruising, actual, 2 to     |
| 21/2 gals. per hr., 30 to 40 miles per gal. |
| Oil consumption-1/2 pt. per hr.; 1400 to    |
| 1500 miles per gal.                         |
| Overall diameter 34 1/4 in.                 |
| Overall length, less starter 23 15/16 in.   |
| Distance mounting ring to prop 13 in.       |
| Diameter mounting ring bolts 121/2 in.      |
| Carburetor Stromberg                        |
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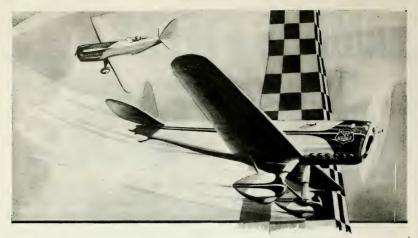
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Combat Aviation Gasoline and Combat Aviation Oil will be available at 1931 National Air Races at Cleveland

# COMBAT

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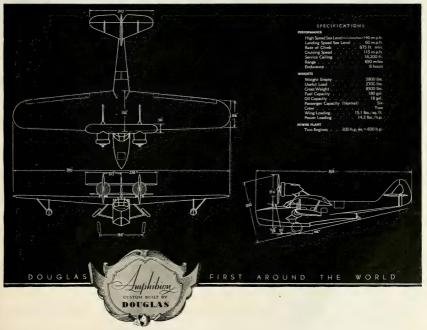
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Three hundred water landings and take=offs within three weeks of operation! That is the strenuous schedule under which the Wilmington Catalina Airline is operating the new Douglas Amphibion on the Pacific Coast. Ten daily and

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Burnelli 20-passenger Transport, equipped with retractable landing gear

# HIGHER SPEED

WITH INCREASED SAFETY, COMFORT AND CARGO SPACE

HE BURNELLI TRANSPORT is not just another airplane. Its development over a period of years has proved a new trend of design for multi-engined airplane advancement. The Burnelli principle heretofore demonstrated in large capacity planes applies equally advantageously to planes of smaller design to meet the present demand of air transportation for higher speed with more frequent service. It combines the high speed qualities of the single engined airplane with the increased size and greater power reliability of the multi-motor plane.

THE following fuselage comparison of the Burnelli type with a high speed single-engined design demonstrates the advantages of the Burnelli type as a high speed passenger and express carrier. Both planes in the following comparison carry equal load per horsepower, use the same wing section, have the same landing speed, equal propeller tip speed and each is equipped with retractable landing gear and tail wheel.

|                                            | HIGH SPEED<br>SINGLE<br>ENGINE | BURNELLI<br>TWIN<br>ENGINE |
|--------------------------------------------|--------------------------------|----------------------------|
| Horsepower                                 |                                | 1.200                      |
| Gross weight                               |                                | 13,300                     |
| Frontal area of fuselage, square feet      |                                | 50                         |
| H.P. per square foot of frontal area       |                                | 24                         |
| Cargo space, cubic feet                    | . 135                          | 550                        |
| H.P. per cubic foot of cargo space         | . 3.15                         | 2.12                       |
| Drag coefficient of body ideally faired    | 00016                          | .00022                     |
| Engine with cooling system                 |                                | .00030                     |
| Lift coefficient of body                   | . 0                            | .0020                      |
| Equivalent wing area saving, square feet   |                                | 140                        |
| Equivalent resistance saving flat plate    | . 0                            | 1.22                       |
| Resulting comparative body resistance pe   | er                             |                            |
| 100 H.P. equivalent flat plate             | 305                            | .290                       |
| Percentage of engine power required by bod | ly                             |                            |
| at 190 m.p.h                               | . 28%                          | 21%                        |
| Engine power required at 190 m.p.h. per 10 | 10                             |                            |
| cubic feet of cargo space                  |                                | 46                         |

The aerodynamic advance of this design is due to the following, as set forth and extracted from wind tunnel research report of the Guggenheim School of Aeronautics, New York University.

- (1) The use of airfoil shaped body while providing large internal space contributes substantially to the lift.
- (2) The body being of airfoil form has a very low drag coefficient.
- (3) The high wing monoplane gives the most efficient wing and body combination.
- (4) The design allows for retraction of the landing gear together with a high wing and body combination.
- (5) The design permits the use of twin engine installation without penalty in additional frontal area.

#### PRACTICAL ADVANTAGES

- Accessible Multiple Engine Compartment, allowing inspection and minor repairs during flight.
- Extensive Reduction of Head Resistance, necessary to high performance.
- 3. Reduced Turning Moment on One Engine, assisting flight with one motor operating.
- Fuselage Lift Reduces Landing Speed, valuable for slower and safer landings,
- 5. Increased Capacity of Fuselage, maximum space for comfort and light cargo.
- Practical Landing Gear Retraction, greater future aerodynamic efficiency.
- Superior Safety in Operation. Protection afforded by engines and propellers being well forward of pilot's and passenger cabin.
- Structural Efficiency and Simplicity. Stresses of engines, propellers and landing gear bear no relation to wing truss
- Convertible to Seaplane or Amphibion. The wide fuselage permits efficient twin float attachment interchangeable with landing gear.

Details of the Burnelli Transport and High Speed types will be sent on request.

> A portion of the interior of the Burnelli Transport showing seating arrangement. Patented fuselage design provides a spacious and comfortable cabin.





#### PRICE

| 45 | hp. | engine. |  |  |  | \$1795 |
|----|-----|---------|--|--|--|--------|
| 37 | hn  | engine  |  |  |  | 1595   |

#### DIMENSIONS

| Length |  |   |  |  |  | 21  | ft. | 8 | in. |
|--------|--|---|--|--|--|-----|-----|---|-----|
| Span   |  | , |  |  |  | 36  | ft. | 0 | in. |
| Height |  |   |  |  |  | . 7 | ft. | 6 | in. |

#### CONSTRUCTION DETAILS

Wing spars of Spruce. Center section leading edge of formed Spruce covered with Birch Plywood, Trailing edge of formed sheet duralumin. Wing tips of covered steel tubing. Wing fittings cadmium plated. Fuselage welded chrome molybdenum steel tubing.

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## pilot-owners have been looking for

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Here is a plane to see . . . to fly. Only by close inspection on the ground and in the air can you saily appreciate the many commendable features of this modern airplane. We shall be pleased to demonstrate the 'Junio' at your convenience.

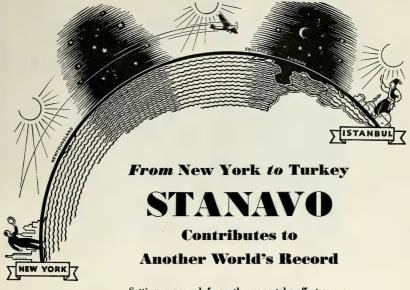
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REARWIN AIRPLANES INCORPORATED

FAIRFAX AIRPORT

KANSAS CITY

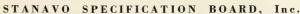
KANSAS



Setting a record from the very take-off, two undaunted aviators recently left Floyd Bennett Field, New York, and headed their plane towards Istanbul, Turkey. Their Bellanca airplane, powered by a Wright Whirlwind engine, had lifted the greatest load ever flown with an engine of 300 horse-power.

Forty-nine hours and twenty minutes later these flyers landed at Istanbul, Turkey—the first eastward non-stop transatlantic aviators since 1927 to reach their announced destination, 5,011 miles had been covered to set a new world's non-stop distance record.

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DAVIS AIRCRAFT CORPORATION, Richmond, Indiana

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## Aircraft Radio

by Lieut. Myron F. Eddy, U. S. Navy, Retired; Director of Radio, AeronauTech Institute. 68 illustrations, \$4.50.

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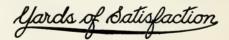
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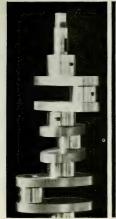


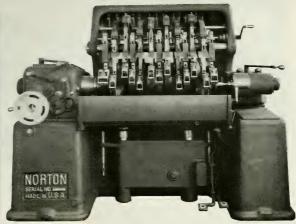
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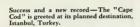
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No. 3

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34 Aero Digest



The National Air Races at Cleveland Offer Variety and Action

# NATIONAL AIR RACES

THE National Air Races of 1931 inaugurate the second decade of this annual American aviation classic. As the cynosure of aeronautics in the United States, the Air Races will center at Cleveland, Ohio, from August 29 to September 7, the attention and interest of the thousands actively engaged in aviation and the millions of the general public.

A dusty three-day meet at Omaha, Nebraska, in 1921, was the crude beginning of the National Air Races having the scope, color and importance of those of recent years. During the six years after 1921, the event was held annually at various cities throughout the country with a threeor four-day program comprised principally of military maneuvers and very little civilian competition. In 1927, however, began the increase of the public's interest in flying, which gained tremendous importance during the past four years. The effect on the National Air Races of this wide-spread interest was apparent, even at its beginning. In 1928, at Los Angeles, California, the Air Races first assumed the proportions of a major event in the annals of American civil and military aeronautics. At Cleveland, Ohio, in 1929, and at Chicago, Illinois, in 1930, the Races were definitely established as an important and significant annual event.

Sponsors of the National Air Races contend that the primary purpose is to contribute to the advancement of flying in all its phases. The Races are organized on the premise that the greatest contributing force in aviation's progress is participation in aircraft competition; that from the technical knowledge which such competition has produced the aeronautical industry has materially profited; and that the National Air Races are one of the major factors in such endeavor.

Aeronautical engineers are provided these competitions to judge the comparative performances of new and improved aircraft design; and, not the least important, professional and amateur pilots are given the opportunity of testing their flying ability in competition.

Inevitably, the Air Races assumed a place of major importance as a national sporting event because of the proclivities for sport inherent in aerial contesting and the spectacular nature of aerial demonstrations generally. Primarily, however, they are maintained for the engineering and promotional benefits which accrue to the aircraft industry. Of importance in this latter purpose, for example, is that thousands of the general public attend the Races. They visit a large air transport center and terminal. They see passenger and mail planes prosaically taking off on schedule. They witness the performances of which modern aircraft are capable. Many will be converted to air travel, flying for the first time on passenger flights arranged on the program especially for this purpose.

It is the opinion of Air Race officials that the next ten years will be an important era in the development of flight in all its phases. They believe that the greatest improvements in design and construction will result from competitions, particularly from those provided by the National Air Races. Towards that end the events for the Races are prepared. The program this year represents a careful study of past projects as well as recommendations made at the contest committee zone meetings and by the aircraft industry at large.

The program includes more than forty closed course events, twelve special speed dashes, the National Sweepstakes Handicap Derby from Santa Monica, California, to Cleveland, with divisions for men and women, and a freefor-all derby. Prizes totaling \$100,000 and trophies will be awarded the winners of the various contests. The speed events will be flown over a course of ten miles, constructed especially for the races. The course is supplemented with a permanent grandstand. This year Cleveland is embarking on an ambitious program, proposing to keep the races at this city for the next five years. Two years ago the races were held at Cleveland.

The 1931 Air Races at Cleveland embody a well-rounded out program of activity for all departments of aviation. The Army Air Corps and Naval Air Service will participate extensively. The Army will be represented by thirty-six pursuit planes from Selfridge Field and the Navy will have contingents from Langley Field and Anacostia, in addition to a group of twelve planes flown by the Marine Corps. The Navy plans to have the new airship Akron at the races.

Considerable interest has been displayed in the 100-mile free-for-all Thompson Trophy speed race which was run for the first time last year at the Chicago National Air Races and won with a speed of 201.9 miles per hour. This year the race will be flown over a ten-mile course, instead of a five-mile one as in 1930, and all turns will be away from spectators. The trophy and a purse of \$15,000 will be awarded. This year to enter the race each competing plane must qualify with a straight-away speed of 175 miles per hour.

The Races have attained international import with the entry of an aerobatics team, headed by Lieut, Alford Williams, formerly of the U. S. Navy. Lieutenant Williams recently made a tour of Europe and obtained the entry in the Races of several well-known European fliers. Among the foreign pilots who have given commitment for official military participation are Flight Commander R. Atcherley of Great Britain, Mario de Bernardi of Italy, Ernst Udet of Germany, Captain B. Orlinski of Poland and Major Alois Kubita of Czecho-Slovakia.

Udet has a plane of his own design, built especially for stunting, while Captain Orlinski has one of the new Polish pursuit monoplanes which have aroused great interest in Europe. This is the first model of its kind seen in this country. Atcherley has an airplane especially equipped for inverted flight and Lieutenant Williams will fly a Curtiss Hawk, powered with a Bliss Jupiter engine.

Twelve special one-mile speed events to establish Air Race records have been inaugurated this year. Race horse starts, incepted for all speed races last year, will again be in effect. All entrants have been urged to select racing colors for their planes.

A special ruling this year requires 150 hours of solo time, including fifty hours on cross-country flights, on the (Continued on page 116)

# Complete List of Events at the

# NATIONAL AIR RACES

(Unless otherwise designated the events listed are open to men pilots only.)

#### SATURDAY, AUGUST 29

Dedication of permanent Air Race Stadium for the five-year program of Mitional Air Races at Cleveland Airport.

Arrival of the U. S. Army Air Corps contingent of 36 pursuit planes of the First Pursuit Group, Selfridge Field, Mt. Clemens, Mich.

Arrival of the Navy contingent of 12 "Striking Eagles," fighting unit from the airplane carrier, the U. S. S. Landev.

Arrival of the Navy contingent of 12 twin-engined patrol flying boats over an inland water route from the Atlantic seaboard.

Arrival of the U. S. Marine Corps contingent of two divisions (12 airplanes) from Quantico, Va.

Special Event 101. One-mile speed dash for airplanes with engines having not more than 275 cu. in. displacement.

Event 2. Thirty-mile race (six laps) of not more than 275 cu. in. Purse \$600.

Event 17. Sportsman pilots, thirty-mile race (six laps). Cabin or open type planes of not more than 120 cu. in., carrying A. T. C. or Group II License. Sportsman Pilot Trophy.

Event 16. Autogiro exhibition and competition. Purse \$1,000.

Event 31. Civilian acrobatic exhibition. Teams of three, by invitation. \$300 daily.

Event 3. Free-for-all (men pilots). Thirty-mile race (six laps). Not more than 400 cu. in. Purse \$1,200.

Event 35. Women pilots. Dead stick landing contest. Prizes \$200.

Event 39. Free-for-all (men only) parachute jumping confest for professionals. Purse \$200.

(Daily features listed at top of page not scheduled for this day,)

#### SUNDAY, AUGUST 30

Special Event 100. One-mile speed dash. Open to airplanes with engines of 115 cu. in. or less displacement.

Special Event 102. One-mile speed dash. 400 cu. in. or less.

Special Event 108. One-mile speed

DAILY FEATURES

Demonstration flying by U. S. Army Air Corps First Pursuit Group Selfridge Field, Mich.

U. S. Navy, "Striking Eagles", fighting unit from airplane carrier, U.S.S. Langley

U. S. Navy Two squadrons of Patrol Boats

U. S. Marine Corps Squadron of fighting planes from Quantico, Va.

Famous foreign fliers led by Lieut. Alford J. Williams Maneuvers broadcast by Cy Caldwell

Cruise over races by U.S.S. Akron, world's largest airship

> Night flying exhibitions Band Concert Fireworks

Finale—U. S. Army Air Corps Feature, "The Flying Comet"

dash. Free-for-all under same qualifications as Thompson Trophy Race (Event 32). Must make 175 miles an hour.

Special Event 111. One-mile speed dash. Free-for-all under same qualifications as women's Aerol Trophy Race (Event 33). Must make 140 miles an hour

Event 4. Thirty-mile race (six laps). Cabin or open type airplanes of not more than 400 cu. in., carrying A. T. C. or Group II License. Purse \$800.

Event 18. Sportsman pilots' thirtymile race (six laps). Cabin or open type plants of not more than 275 cu. in., carrying A. T. C. or Group II License. Sportsman Pilot Trophy.

Event 24. Women pilots. Thirty-mile race (six laps). Cabin and open type planes of not more than 350 cu. in., carrying A. T. C. or Group II License. Purse \$1,000.

Event 16. Autogiro exhibition and competition.

Event 31. Civilian acrobatic exhibition. Teams of three, by invitation. \$300.

Event 1. Free-for-all (men pilots).



Thirty-mile course (six laps). Not more than 275 cu. in. Purse \$1,000.

Event 34. Dead stick landing con-

test. Prize \$200.

Event 39. Free-for-all (men only)

Event 39. Free-for-all (men only) parachute jumping contest for professionals. Purse \$200.

Arrival of Men's Handicap Derby

Arrival of Women's Handicap Derby from Santa Monica, Calif.

Presentation of Men's and Women's Handicap Derby Sweepstake Prize (a sport automobile valued at \$2,500).

#### MONDAY, AUGUST 31

Special Event 103. One-mile speed dash. For airplanes having engines with 510 cu. in. or less displacement.

Special Event 109. Women pilots. One-mile speed dash. 510 cu. in. or less.

Event 108. One-mile speed dash. Free-for-all under same qualifications as Thompson Trophy Race (Event 32). Must make 175 miles an hour.

Event 111. One-mile speed dash. Free-for-all under same qualifications as women's Aerol Trophy Race (Event 33). Must make 140 miles an hour.

Event 6. Thirty-mile race (six laps). Cabin and open type planes of not more than 510 cu. in. Purse \$800.

Event 19. Sportsman pilots' thirtymile race (six laps). Cabin and open type planes of not more than 350 cu. in., carrying A. T. C. or Group II License. Sportsman Pilot Trophy.

Event 26. Women pilots. Thirty-mile race (six laps). Cabin and open type planes of not more than 650 cu. in. Purse \$1.150.

Event 16. Autogiro exhibition and competition.

Event 31. Civilian acrobatic exhibition. Teams of three, by invitation. \$300.

Event A. Free-for-all (men pilots). Thirty-mile race (six laps). Not more than 115 cu. in. Purse \$800.

than 115 cu. in. Purse \$800. Event 35. Women pilots. Dead stick landing contest. Prizes \$200.

Event 39. Free-for-all (men only) parachute jumping contest for professionals. Purse \$200.

Arrival of Transcontinental Freefor-all Derby. Derby fliers start from Los Angeles and must arrive in Cleveland before 7 p. m. Eastern Standard Time the same day. Open to men and women pilots flying any type of amplane with any type of engine or engines. Pilots may fly non-stop or land. Purse \$15,000.

#### TUESDAY, SEPTEMBER 1

Army Day

Entire First Pursuit Group of 72 fighting planes from Selfridge Field, Mich., in a special program of tactical and formation flying inaugurating "Army Day" ceremonies.

Special Event 108. One-mile speed dash. Free-for-all under same qualifications as Thompson Trophy Race (Event 32). Must make 175 miles an hour

Special Event 111. One-mile speed dash. Free-for-all under same qualifications as women's Aerol Trophy Race

(Event 33). Must make 140 miles an

Special Event 104. One-mile speed dash. For airplanes having engines with 650 cu. in. or less displacement.

Special Event 110. Women pilots. One-mile speed dash. 800 cu. in. or less.

Event 8. Thirty-mile race (six laps). Cabin and open type planes of not more than 650 cu. in., carrying A. T. C. or Group II License. Purse \$1,200.

Event 20. Sportsman pilots' thirty-mile race (six laps). Cabin and open type planes of not more than 450 cu. in, carrying A. T. C. or Group II License. Sportsman Pilot Trophy.

Event 25. Women pilots. Free-forall thirty-mile race (six laps). Not more than 510 cu. in. Purse \$1,000.

Event 16. Autogiro exhibition and

Event 31. Civilian acrobatic exhibition. Teams of three, by invitation.

Event 5. Free-for-all (men pilots). Thirty-mile race (six laps). Not more than 510 cu. in. Purse \$1,200.

Event 39. Free-for-all (men only) parachute jumping contest for professionals. Purse \$200,

## WEDNESDAY, SEPTEMBER 2

Special Event 105. One-mile speed dash. Open to airplanes having engines with 800 cu. in. or less displacement.

Special Event 108. One-mile speed dash. Free-for-all under same qualifications as Thompson Trophy Race (Event 32). Must make 175 miles an hour.

Special Event 111. One-mile speed dash. Free-for-all under same qualifications as women's Aerol Trophy Race (Event 33). Must make 140 miles an hour.

Event 10. Fifty-mile race (ten laps). Cabin and open type planes of not less than 400 cu. in. and not more than 800 cu. in., carrying A. T. C. or Group II License. Purse \$1,600.

Event 21. Sportsman pilots' thirty-

mile race (six laps). Cabin and open type planes of not more than 650 cu. in., carrying A. T. C. or Group II License. Sportsman Pilot Trophy.

Event 16. Autogiro exhibition and competition.

Event 31. Civilian acrobatic exhibition. Teams of three, by invitation. \$300.

Event 7. Free-for-all (men pilots). Thirty-mile race (six laps). Not more than 650 cu. in.

Event 39. Free-for-all (men only) parachute jumping contest for professionals. Purse \$200.

Event 35. Women pilots. Dead stick landing contest. Prizes \$200.

## THURSDAY, SEPTEMBER 3

Navy Day

Special cruise of the U. S. S. Akron, world's largest dirigible, over the air races, inaugurating Navy Day ceremonies. Escort of the "Striking Eagles," fighting squadron from the carrier Langley, flying patrol boats and Marine Corps planes from Quantico, Va.

Special Event 108. One-mile speed dash. Free-for-all under same qualifications as Thompson Trophy Race (Event 32). Must make 175 miles an hour.

Special Event 111. One-mile speed dash. Free-for-all under same qualifications as women's Aerol Trophy Race (Event 33). Must make 140 miles an hour.

Special Event 106. One-mile speed dash. Open to airplanes having engines of 1,000 cu. in. or less displacement.

Event 12. Fifty-mile race (five laps) Cabin and open type planes of not more than 1,000 cu. in., carrying A. T. C. or Group II License. Purse \$2,000.

Event 22. Sportsman pilots' fifty-mile race (10 laps). Open and closed type planes of not more than 1,000 cu. in., carrying A. T. C. or Group II License. Purse \$2,000.

Event 16. Autogiro exhibition and competition.

Event 31. Civilian acrobatic exhibition. Teams of three, by invitation. \$300

Event 9, Free-for-all (men pilots) thirty-mile race (six laps). Not more than 800 cu. in. Purse \$2,400.

Event 34. Dead stick landing contest. Prizes \$200.

Event 39. Free-for-all (men only) parachute jumping contest for professionals. Purse \$200.

### FRIDAY, SEPTEMBER 4

Event 33. Cleveland Pneumatic Aerol Trophy Race. Free-for-all high speed classic for women pilots. Any type and powered ship. Qualifying speed of 140 miles an hour required. Fifty-mile race (five laps). Aerol Trophy and purse of \$7,500.

Event 28. Women pilots. Fifty-mile race (five laps). For cabin and open type planes having engines with not more than 1,000 cu. in. displacement and carrying A. T. C. or Group IJ License. Purse \$2,500.

Event 30. Men and women pilots. Mixed race by invitation. Approximately 1,000 cu. in. Distance to be decided by contest committee. Purse \$2,500.

Event 16. Autogiro exhibition and competition.

Event 31. Civilian acrobatic exhibition. Teams of three, by invitation. \$300 daily.

Event 27. Women pilots. Free-forall fifty-mile race (ten laps). Not more than 800 cu. in. Purse \$2,000.

Event 35. Women pilots. Dead stick landing contest. Prizes \$200.

Event 39. Free-for-all (men only) parachute jumping contest for professionals. Purse \$200.

#### SATURDAY, SEPTEMBER 5

Special Event 107. One-mile speed dash. Open to planes having engines with not more than 1,785 cu. in. displacement.

Special Event 108. One-mile speed dash. Free-for-all under same qualifications as Thompson Trophy Race (Event 32). Must make 175 miles an hour.

Special Event 111. One-mile speed dash. Free-for-all under same qualifications as women's Aerol Trophy Race (Event 33). Must make 140 miles an hour.

Event 36. Air transport speed and efficiency contest. Five laps over a temmile course. Award determined by greatest number of merit points according to 1931 National Air Tour formula. Purse \$2,000.

Event 38. National Guard Race for the Douglas Trophy. Fifty-mile race (five laps). Open to military twoplace planes only.

Event 16. Autogiro exhibition and competition.

Event 11. Free-for-all (men pilots) fifty-mile race (five laps). Not more than 1,000 cu. in. Purse \$3,000.

Event 31. Civilian acrobatic exhibition. Teams of three, by invitation. \$300.

Event 34. Dead stick landing contest. Prizes \$200.

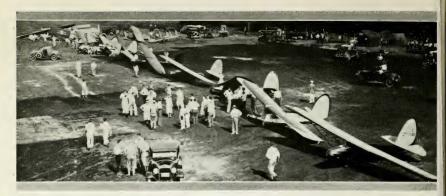
Event 39. Free-for-all (men only) parachute jumping contest for professionals. Purse \$200.

#### SUNDAY, SEPTEMBER 6

Special one-mile speed dashes for world speed records for men and women pilots using any type of plane with any type of engine or engines.

Event 15. Amphibion novelty race. Trophy.

Event 14. Fifty-mile race (five laps). (Continued on page 102)



Line-up of gliders at the Elmira airport. In background, tent barracks used by some of the contestants

# SECOND NATIONAL SOARING MEET

## R. E. Dowd

AST year at the close of the first National Soaring Competition, it seemed that almost everyone who had been interested in the glider movement in America lapsed into a sort of a speculative mood as to its future. Opinions and predictions were plentiful. Some were favorable; many were not.

Of only one thing were we certain. That was the fact that a highly successful competition had been run off. Records were made only to be promptly broken. The National Glider Association under the able leadership of Don Walker had established its importance as a guiding body for glider activities on a national scale. But still we speculated. Hard-headed Americans habitually look for outstanding utility of a new project before it gains their endorsement. The utility of the glider was not readily apparent to the layman. The question seemed to be, "its this the beginning or the end of the end of America's Glider Movement?"—The 1931 contests have given us the answer. It was only the beginning.

August 1st to 16th were the dates of the second National Gliding and Soaring Contest. It has now passed into history as another milestone of American glider achievement. A total of twenty-six gliders and some thirty-seven pilots were entered in the many events. Twenty-one pilots qualified for their soaring or "C" licenses. Twenty-three passed their "B" and twenty-five won their "A" ratings. Eight different types of gliders competed in the many contests. Approximately eighty-eight hours of motorless flight were accumulated during the meet.

Contestants this year rode on the wings of thunderstorms, floated in the chilly depths of summer clouds, and cruised away on cross-country trips to distant landings, disturbing the rural solitude of country folk as they swept low over the farmhouses.

Over the airport, activities were no less spectacular.

Hurdles of twine were skillfully grazed by huge gliders whose pilots, once past the hurdles, vied with one another to bring their crafts to a stop in a minimum distance. "Bombs" of flour in paper bags were hurled at targets placed on the field and spot landings were made after passing over the targets. But most thrilling of all were the balloon bursting contests in which the pilots, like knights of old with lances in hand, charged down on captive balloons with deadly aim.

It was a most impressive demonstration of superb skill and unfailing sportsmanship.

As early as Friday night preceding the opening of the contest, caravans of cars, bicycles, gliders and trailers found their way into peaceful Elmira. Months of hard work in raising funds, directing advertising and planning many events had keved up the townspeople to a high pitch of expectancy. Visitors were coming and they were to be properly welcomed. Civic pride mingled with true hospitality was everywhere in evidence. The Y. M. C. A. and the Mark Twain hotel soon bustled with activity as more and more teams put in an appearance. Two boys rode their bicycles all the way from Philadelphia and camped in tents near the airport for the duration of the meet. From all sections of the country they came, some individuals, some families, others came as clubs and teams representing clubs. It was a glorious reunion for the veterans and a thrill of a lifetime for the newcomers.

Some of the cities identified by representatives among the contestants were, Akron, Detroit, New York, Northampton, Le Roy, Norwich, Ypsilanti, Pittsburgh, Patterson, Providence, Washington and Montour Falls. Excellent opportunities were offered for the contestants to qualify for their license ratings. Many had been trained over level ground and had their first trials at soaring during their qualifying flight.

The official opening of the contest was Sunday although Saturday brought out an ambitious group of "early birds" who sought to try their wings in practice flights. The weather man started being disagreeable on the opening day and real activity did not get under way until Monday when Albert Hastings hopped off East Hill. W. Hawley Bowlus made a timely arrival by airplane tow from Le Roy, New York and in his descent checked the currents over the East Hill site. On landing, his favorable report sent ten gliders hurrying off to the take-off point. The meet was now in full swing and as soon as bargraphs were properly smoked and made available, ship after ship left the ground.

There is neither space nor occasion at this time to trace the events day by day, even though they offer a most interesting series. Consequently some of the outstanding flights only will be covered.

#### Hastings Eight-Mile Storm Flight to Erin, August 3

After the take-off from East Hill which we have pictured, Al Hastings soared back and forth over the ridge for a considerable time, then headed out across country, disappearing from sight. In his own words, he tells of his experience: "I soared from East Hill to Horseheads, and thence to Breesport, finding excellent flying conditions. At Breesport I lost altitude when I attempted to cross a draw and turned back to wait for a thunderstorm which I saw approaching in the distance.

"The advance clouds of the storm gave me plenty of altitude and I soared across the draw easily. However, the storm approached a little too rapidly and several times I was above the clouds, losing sight of the earth entirely. After a time I began to lose altitude and the rain began so I picked out a field and landed. A farmer told me it was Erin."

Hastings' barograph indicated an altitude of almost 2,000 feet in probably the first storm soaring to be done in America.

#### Schempp's Three-Hour Thermal Soaring

Martin Schempp of the Haller team from Pittsburgh made a most remarkable three-hour flight in the Americanbuilt Haller-Hawk. At the time of take-off from east ridge, a wind of only four miles per hour was registered. Yet in these light conditions the great Hawk, which is apparently patterned after the German R.R.G. "Professor," maintained its altitude until the sinking sun robbed it of its support and a landing was made on an athletic field. In describing his landing in the Elmira Star Gazette, Schempp said in part—"I decided to dive for an athletic field nearby, although a high tension line and telephone wires protect it fairly well from any visitors from above. It took plenty of curving, fish tailing, and sideslips, to kill all the speed of my sailplane, before it settled down safely just at the end of the field in front of a row of trees which made me use the brakes on my single air wheel as hard as I could pull them. Two and a half hours soaring mostly on hot air; let's call it a day."

#### Mass Soaring Friday, August 7

An unexpected wind in advance of a light storm furnished an opportunity for action on South Mountain. The ships had been gathered there for license tests and also in hope that a wind would spring up which would allow soaring. As the wind freshened, nine ships took off at intervals of only a few minutes beating last year's record for mass soaring by two. Meanwhile Al Hastings took off from the airport by auto tow and headed for the soarable region near South Mountain. He was attempting the difficult feat of landing on the mountain top from the airport. The storm overtook him as well as the other ships which were in the air and they were all forced down, some making the airport and others making emergency landings at the base of the mountain.

#### Mrs. Barnaby and Mrs. Holderman Win "C" Ratings

It is a significant fact that the first soaring license to be issued in the United States was awarded to Lieut. Ralph Barnaby some two or three years ago, after qualifying at Cape Cod. On Wednesday, August 12, Mrs. Ralph Barnaby earned the distinction of being the first woman pilot to obtain her "C" class rating.

Mrs. Russell Holderman, a few minutes later gained

Mrs. Russell Holderman, a few minutes later gained for herself a similar status and later established a new woman's duration record of 46 minutes.

#### Battle for Duration Honors and Trophy

With the close of the meet approaching, the pilots were out early for duration honors. Al Hastings of Elmira, Wally Franklin of Ypsilanti, and Bud Stickler of Wash-(Continued on page 102)



Pilots who participated in Elmira competition. Albert Hastings, endurance contest winner, is second from left

# THE WORLD'S NEW CROSSROADS

# By Don Rose

A MONG those present at the conclusion of the transocean and round-the-world flights of this busy summer I was conspicuous by my absolute absence. Not
many of them, I admit, came to a finish within range of
my personal attention. I could not conveniently be in
Hungary, Denmark, Turkey, North Wales, Alaska, Australia and Japan, in spite of the depression and the ample
opportunities it offers to take extended vacations without
pay.

I was not even there when Post and Gatty got back where they started, for the reason that I do not care to be cracked on the shins by a nightstick nor to take part in a crowd simply in order to talk about it afterwards. I have been suspected, therefore, of a serious shortage of enthusiasm for the current achievements of aviation. And to

some extent the accusation is accurate.

I am not much aroused by endurance records and not at all inspired by the public pandemonium that surrounds them. I don't care much whether it takes nine days or nineteen days to get around the world, since I am not going around the world. I wonder sometimes, indeed, whether it will be discovered some day that the straight line is still the shortest distance between two points and that the quickest way to around the world and back is to stay where you are. And I seriously suspect that it is not altogether wholesome for aviation that public attention should be concentrated so much on an airplane chasing its tail or flying to the other end of the world with nothing to do when it gets there.

But this does not mean that I see no significance in the current custom and prevalence of long-distance flying. Its accomplishments, however, are incidental to its intentions. With rare exceptions, the pilots are inspired by practical and personal purposes. Their backers expect them to bring home some bacon; their sponsors are not entirely disinterested in promoting these pioneer ventures. Most of them are business enterprises, and not experiments in the pure science and art of aviation. If they weren't, in fact, there probably wouldn't be any.

One reason why this Nation leads the world in adventurous achievement is that we hang up the biggest prizes for success. We have a national taste for heroes and a national aptitude for excitement, and we are willing to pay well for our fun. If a man wants to go by submarine beneath the ice to the North Pole, we cheer him on his way without much regard for the good it will do us if he gets there. If he gets there and comes back again, we put on a parade and pay all the expenses. It's a good old American custom, and its consequences are curious.

For the by-products of such performances are nearly always more important than the stunts themselves. The achievement may be only another romantic item in the day's news and entertainment, but its effects may go far and wide and lead at last to some uncontemplated contribution to civilization. That, I think, is entirely true of this exciting year of trans-Atlantic, round-the-world and over-the-Pole flying. It may be reasonably argued that none of them has contributed a nickel's worth of profitable

progress to our favorite industry. The demand for trans-Atlantic transport planes has not yet overwhelmed the manufacturers. The airports report no excess profits from the entertainment of world tourists by air. The scheduled air services carry neither more nor less because Post and Gatty got back safely to Oklahoma. But the indirect effect of all these flights is changing the course of civilization.

Is there any such thing as a pioneer flight? Not in the sense that the first man through the wilderness beats down the trail for others to follow or establishes a new outpost for further expeditions. The air is not made more navigable because somebody has flown it before, nor does a cracked-up plane in the desert make a better landing for the next one. A blind flight to the other end of nowhere might break all the records in the book and leave nobody any better for it. A lone pilot might land on the moon and make the trip no more attractive to the rest of the brethren.

But successful long-distance flights are not made in hitor-miss fashion. They require something more than good intentions on the part of the pilot. They must be routed with some regard to places where a plane can sit down and where the man at the wheel can buy five gallons of gasoline and a ham sandwich. And if this season of surprising flights is really important, it is because it represents the fact that the world at large has broken out lately with airport possibilities like a baby with the measles.

The flights to Europe, of course, are the result rather than the cause of this condition. There was once a time when all trans-Atlantic flights led to Le Bourget. Now the ambitious aeronaut can put his thumb anywhere on the map of Europe and decide to land at the airport beneath it. If he misses that one, there are plenty of others. If he runs out of gas five hundred miles from his destination, he can usually come down and fill his tank, get his bearings and probably pick up the weather reports. If he can fly far enough and straight enough to hit Europe, he won't need to walk when he gets there. He can, indeed, do as one pair of flying tourists did and cruise all over the continent looking for Denmark. It wasn't that way ten years ago.

But the remarkable circumstance of this year of grace is that the same sort of thing is becoming possible on the scale of all outdoors. Strange cities and far places are not only accustomed to aircraft but are prepared to entertain them. Such jaw-breaking communities as Irkutsk, Khabarovsk, Karaginsk, Aklavík, Delitgari, Omsk and Blagoveschensk have earned a placed on the world's air maps. Lonely places in Northwest Canada, small towns in Alaska, islands in the Bering Sea are way-stations for the flights of 1931. Deep in Asia and up in the arctic zone are clearings and gasoline drums and a kit of tools for the way-farers of the sky.

The same thing is true on the other side of the world. The winged fleets of Europe have made nests in deserts and jungle country, on lonely islands and mountain sides. The far-flung plans and policies of empire needed them and

(Continued on page 122)

## THE FLIGHTY SEASON

by baldwell

URING the weary years that you six disgruntled readers have plodded patiently through these pages ——hoping against hope for a little ray of sunshine here and there—you may have noticed that occasionally I notify you that I have changed my mind. This, I believe, is my sole claim to distinction in the world of words, especially of words relating to the air and its conquest by aviators, or vice versa, as the case so often turns out.

Men and women who have degenerated into the pernicious business of writing soon acquire the happy faculty of infallibility—anything they write instantly becomes a fact, immutable, unchangeable for all time. At least, it becomes a fact to them, no matter how it may appear to the world at large. Now I, unfortunately, never have managed to grasp this cheering complex. Things that I put forth hopefully as facts sometimes turn around and bite me, as mere fancies; and the distressing thing is that I am able to recognize that I have been bitten. Unlike the average writer, my hide is still pervious—which means that a hole can be shot in it. And when a fact turns around and bites me, I let out a yelp and inform you six patient souls that I have been sturn again.

Such now appears to be the state of affairs with my fondly held opinions on the subject of ocean flying in landplanes. I believe that it would be easy for me to retain your good opinion as an infallible prognosticator—for I have but little doubt that you have happily forgotten what I said on the subject of ocean flying some three years ago. However, an undeviating fondness for the truth, even when painful, forces me to remind you that in 1928 in these pages I roundly condemned any further flying across oceans in unsuitable equipment, on the grounds—which at that time appeared reasonable—that such antics were hurtful to sound, sane, useful commercial aviation.

I still believe my stand was sound at the time, and that many people who might have patronized the airlines were dissuaded from doing so by the constant succession of inevitable delays and occasional disasters that attended these ventures by ocean fliers, for after all they and the airlines were all part of that great mystery known as aviation.

If I'd been a trifle brighter, however, — I'm continually grieving because I'm not brighter — I might have seen far enough ahead to predict that in time the public itself would learn to distinguish between the sanities and inanities of this jolly game of the air. That time, I now believe, has arrived; the travelling public is sufficiently educated, the airlines well enough established, so that the occasional intrepid birdman may fail without any resulting damage to the business of hauling passengers.

This may, at first glance, appear to be a rather heartless way of expressing the situation, and may leave you with the impression that I am a particularly cold-blooded and unfeeling individual. Such is not the case. I am, on the contrary, one of the tenderest of men, especially on the left little toe, where I carry a corn of long association after the suffering always affects me deeply, as does such a

case of prolonged misery as that endured by the Democratic party; and I cry at the slightest provocation, or at no provocation at all.

Now on this subject of ocean flights at this flighty season of the year there is much to be said. I already have admitted that I have changed my ideas of three years ago, mainly for the reason that the conditions that led me to form those ideas have themselves changed to a great extent. Airline operation, I am convinced, at last stands on its own merits-and occasionally falls because of its demerits. No longer is it dependent, either for helpful or for adverse publicity, upon the flights of any pilots other than those flying upon the airlines. Even the private pilot and the small commercial operator, his success or his failure, has practically no effect upon the airline passenger, who has learned that the airline is a distinct unit of more or less sound transportation value, standing on its own feet. feel that the airlines have reached a stage of development where even the antics of famous pilots can't hurt them.

And if that is true of the lines, it is equally true of the operators who carry passengers sanely at airports. The public understands now, I am convinced that the disappearance of a noted pilot in an ocean does not necessarily connote that if they go up to take a look at their home town that they, too, will vanish, via the newspapers, into oblivion.

If such now is the condition—and I think it is—what sensible objection can be raised against ocean flying in landplanes, seaplanes, flying boats, balloons, kites, or what your facile fancy dictates? Frankly, I can find none. As an old objector to this sort of thing, I am coming out fairly and squarely now as being in favor of it. It is not that I have changed in the slightest degree my opinion of the value of the practice—for I haven't; it is simply that I recognize now that the venture, due to changed conditions, no longer is hurtful to anyone other than the participant and his immediate circle of relatives and friends, which, after all, is solely his and their concern, and none of my business.

The gentleman whose peccadilloes in the atmosphere first began to win me to this changed viewpoint was my old friend, liberally speaking, Sir Hubert Wilkins. I have known that amusing old capital-collector for years, ever since he arrived here a mere Captain-in what, or of what, I have never discovered-and even before he possessed the luxuriant crop of whiskers that to-day are the admiration and the envy of every bearded lady in the side-shows. Soon after his arrival I had taken him into the air while he tested a sun sextant, or some such gadget, with which he was going to arm himself and gaze upon the North Pole. We grew acquainted, but not chummy. I have thought since that my somewhat derisive remarks on the benefits accruing to humanity from polar flights made for a noticeable coolness between us. I mean to say, he never leaped up and down, or barked, or gave any other indications of extreme pleasure at the odd times during the ensuing years when we met. Not that he disliked me-I don't think he did—he never bit me, or anything, but I got the feeling that if I had never lived he'd have been just as happy.

Well, as you know, he went up around the Fole, flew around, disappeared, was lost, got found, got lost again, was found, lost, found, and so on. If he had disappeared entirely the public wouldn't have remembered whether the last thing they had heard about him was that he was lost or that he was found. And anyhow, what would it have mattered, so far as aviation down here was concerned? The way I always felt about George was—by the way, we called him George then, but he didn't like it—the way I felt about him was that if anything happened to him nobody would think to blame the air mail operators.

That isn't so far-fetched as it may sound, because right after the Dole Disaster I had business men shake their heads at me and say, "There you are—that shows how dangerous aviation is!" At that time they couldn't distinguish between a man flying from New York to Los Angeles in a tested commercial plane and another trying to transport himself, apparently by some species of legerdemain, from Oakland to Honolulu, assisted by an experimental type of airplane and two luck charms. To-day even the public knows the difference, thanks almost solely to the efficient and sensible operation of our airlines, and sensible publicity.

So you see I gradually divorced in my own mind the mere scenery from the sturdy back wall of the aerial theatre. That sound wall was the commercial development, and through the years it did as well as could be expected, hidden by all this tinsel, but there, nevertheless. By the time the public had discovered the soundness and sturdiness of it, the flashy stuff in front was recognizable for what it was, whatever it was.

Now another thing—the newspapers would be very dull without their accounts of these adventures. Long since the kick has departed from the stock market quotations—the last kick being directed accurately at the seat of our pants. There is no longer anything to gamble on, for if you place your bet on a stock it is almost a certainty that it will go in only one direction. What remains to add the spice of uncertainty to the daily paper? Only the current aeronautical absurdity. Will he make it?—or not? Will he hit Honduras?—or Hatteras?—or Haco? Will the lady get off this time? Will the gentlemen tote their load of gas overseas?—or will they imitate the municipal watering-cart, and soray Brooklyn?

You see what I mean. Here, in this modern age, we have all the thrills of the old Roman Coliseum brought to our door. Better still, we have it brought right into the air of our homes, over the radio. Who is going to win this widely publicized encounter?—the aerial gladiator or the sea lion? They can't both win—it isn't like a prize fight where winner and loser both win and the fight fans lose. In these gladiatorial contests of the sea and air either the contestant wins, or he loses with a splash

It was Wilkins who put the finishing touch on any stray sympathy I might have cherished for these venturesome gentry. When he visited some naval junk heap and retrieved that decaying submarine from a pile of old bean cans, ripe olive jars, and broken bottles, announcing that he was going under the Pole in it, I just took the remainder of the tears I had stored up to shed for missing explorers, and watered my gladioli with them. I came to the conclusion that he was simply a chappie who wanted to go places the worst way. And I came to the studied conclusion that the rest of the far-flying lads are of precisely

the same caliber. It just happens they are still doing in airplanes; Wilkins has graduated to submarines.

If these lads weren't flying airplanes they'd be racing automobiles, or exploring the jungles of South America, or climbing mountains. They're simply built that way. They want things, that's all. They want to go places, in ways that others haven't gone; they want their names in the paper. They want to do something out of the ordinary, something the rest of us don't want to do, and perhaps couldn't do even if we wanted to. Most of us haven't the nerve, the rest of us have too much common sense to try.

And now the women are at the same old tricks. I see where they're going over the Atlantic. For what? To "advance the science of aviation?" Don't be silly! The girls have discovered that nobody is an aviation authority until he has flown across an ocean.

Old Hold-your-horses, or whatever his name was, flew to Denmark—and when he got back everyone had forgotten that he'd even taken off! That, by the way, was a funny one. . . . He flew over ostensibly to visit his parents whom he hadn't seen for years. Now, you might think he'd want to visit with them at least for a week or two. But no—he landed, said, "Hello, folks, when is the next boat back to New York?" and caught the next one. Meanwhile Post and Gatty had been inconsiderate enough to fly around the world, so poor old Hold-your-horses was lost in the rush. There are certainly some touching incidents in this adventure business, aren't there?

Only, I refuse to be touched. We all have learned enough to realize that the further advancement of aviation will not come through pilots, leaping across large bodies of water. It smacks too much of walking across the Niagara Gorge on a tight-rope. These seadromes of Armstrong's are a different matter, by the way. There is a scientific approach to the problem—successful or unsuccessful, as will in due course appear. Incidentally, if his equipment shows up satisfactorily, I see no reason why the scheme should not be entirely successful.

From now on I am a booster of ocean hops in airplanes, seaplanes, flying boats, submarines, and canoes. I am living a very quiet life, a very tame one. Nothing ever happens to me. Nothing much, I suspect, ever happens to you either. Very well then, let us get what excitement we may from these flights. Bull fights are prohibited here; shooting people is not permitted—except by licensed gangsters; murder is frowned upon, except by nations in time of war. What remains to supply thrills to our jaded minds? Only these flights, these daring gambles with death.

Meanwhile, as I am writing this, good old Sir Hubert is pushing on, and under. He doesn't bulk very largely in the news just now, but he's in. He's in back, with the linseed oil and cotton quotations, but he's in. "Submarine's engine stops off Newport." A week later: "Wilkins stopped again." Another week, "Halifax reports Wilkins submarine hove to for repairs." A month later, "S. S. Nausea reports floating derelict on port bow-undoubtedly Wilkins." Report later confirmed: "It was Wilkins, naturally. Now being towed to Portsmouth." And so on. I've lost track of him for the moment. They shoved him behind the raw sugar and molasses quotations, and I couldn't find him for a week. Then I saw, beside the dressed beef prices: "Wilkins' submarine, the Nutty Lass, reported floating near Spitzbergen, or perhaps it was a whale. Who cares?" Nobody, apparently, for he hasn't been mentioned for days and daze and daze.

## EDITORIALS

#### SELLING THE IDEA OF SPEED

O sooner does James G. Hall break a cross-country speed record than Frank Hawks goes out and trims it down further. And vice-versa, of course. The possibilities of high-speed flying between distant cities are thus demonstrated by these friendly flying rivals who have had the game pretty much to themselves lately.

The anti-prohibition cause and The Texas Company are helped by Crusader Jimmy and Smiling Frank, while the contest-loving public enjoys reading of the latest inter-city speed record shattered by one or the other of these good-natured fliers. Speed, Hawks admits, has no commercial value unless you are going some place. Fortunately, there seem to be plenty of places to fly to.

Here is an outlet for speed that comes close to selling the public on the idea.

#### LIG THINGS COME TO PASS

HE world's largest airship, the U. S. S. Akron, and largest amphibion, the Sikorsky S-40, are now undergoing their trial flights. Both these new giant flying craft represent high points in engineering skill in their respective fields of lighter-than-air and heavier-than-air. If Count Zeppelin could have lived to see his ideas materialized in such a stupendous craft as the Akron with its six and one-half million cubic foot gas volume! The dock which houses the Akron is also the largest of its kind, being almost twice as big as any ever built in Germany where the airship art originated.

The world will watch with interest the extensive flight tests which will show whether or not even larger ships of the air are feasible from an engineering as well as an economic point of view.

Our salutations to the minds who conceived these projects and to the far-seeing, courageous men who directed their production.

Fast flights, happy landings and safe moorings!

#### ENCOURAGE THE PIONEERS

NFOUNDED doubt and opposition directed to unconventional design have been a retarding influence in aviation. Lack of a constructive attitude during the evolutionary period of aviation may be attributed to our inherited belief through centuries of the impossibility of flight by mechanical means.

After the Wrights proved flight itself to be practical, skeptics continued to underestimate the safety, military usefulness, commercial load carrying ability, size increase and high-speed possibilities of aircraft. Skepticism followed the attributes which helped to make advancements possible. As we look back we see that the development of thick cantilever wings, metal construction, metal propellers, retractable landing gears, high-powered air-cooled engines, geared engines, the use of light alloys and weld-

ing, as well as numerous other contributions to aviation, were retarded by expressions of doubt even though these developments were based on sound trial and error methods attendant upon the development of all new devices and methods.

Encouragement should be directed to ways and means to increase rapidly the efficiency and utility of the large airplane. It is from this source that we can hope for a more intensive use of our airlines with a corresponding increase in business. Keeping an open mind will help in determining whether or not a design is impractical or one which is a logical step in the march of aeronautical progress.

#### INTERNATIONAL GOOD WILL

AGAIN this year a group of famous European pilots are in the United States as guests of the National Air Race Association. They will show us some of the types of flying for which they are renowned in their respective countries. But aside from their flying, their presence is auspicious as it presages a more extensive exchange of idea and relations between flying men of the United States and of foreign countries. Barriers of distance are overcome and international boundaries become less important when flying men meet on common ground.

It is a good thing for international friendships when our flers visit other countries and we in return welcome to the United States the present team of pilots invited here by Al Williams in behalf of the Air Race Committee. Those interested in technical progress will also appreciate seeing the types of airplanes they will fly. The visit of the German Dornier Do. X to our shores is another source of interest in this regard. Each year we may expect to see foreign airmen in greater numbers not only at our air events but on flights whose purposes of adventure or of scientific achievement will lead their courses more and more often across the seas to our ports.

#### HAZARDOUS FLIGHTS

DIVERGENT opinions on the value of trans-ocean flights are expressed in the articles by Don Rose and Cy Caldwell in this issue of Aero Digest. Both these able writers are noted for their keen insight and observations on current aeronautical topics. The fact that they do not always agree is the more interesting since it suggests to the reader that he draw his own conclusions on the subject.

There will always be the occasional ill-fated stunt flight which retards progress in the industry. But statistics reveal that the high percentage of successes more than outweigh the harm done by the improperly conducted flights that furnish a topic for our more colorful journals.

We notice that scare headlines on airplane flights are getting so infrequent that they have to be manufactured; for example, we find such headlines as "Lindberghs Lost!" reporting that "the Lindberghs have taken off for so-and-so and have not been heard from for an hour!" And reports such as this have been repeatedly served up to the man in the street, even though the fliers were not due at their destination for several hours.

After all, it may be a good sign of progress when carefully planned and capably managed flights must be made to appear more hazardous than they really are.

## RADIO FOR THE PRIVATE OWNER

UCH has been written about radio and its various uses. Still its general application is little understood. So far, most of the articles that have appeared have told of the application of radio for air transport lines. This is natural because the large development, commercially, of aviation during the last three years has been towards establishing reliable speedy means of transportation for both mail and passengers.

Two essential features were required to make air transportation acceptable. The first was safety and the second reliability. Planes could be and were built that were speedy and safe. Every possible precaution was taken. Better motors were developed, better instruments were provided to the same proper of the same proper of the same provided that the same provided provided the same provided that the same provided provided the same provided that the same provided provided that the same provided that the

vided and better landing fields were established. Still man could not control weather and could not prevent sudden emergencies arising. When a plane is in the air it is like a ship on the ocean. Unless it is equipped with radio, it is out of touch with all human control except that of the pilot. Through radio, the ground personnel and pilot are in constant telephonic communication and thus in case of emergency the pilot may be warned of conditions ahead it time to take the necessary precautions.

To meet successfully the requirements of reliability, the planes must keep schedules on time and be ready to start

By H. E. Young

General Commercial Engineer

Western Electric Company



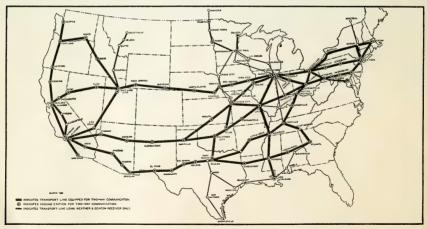
Helmet used by private flier in receiving weather reports and maintaining communication

no matter what sort of weather conditions are met. How successfully this has been accomplished may be seen by studying the Post Office Department records for October, 1930, which showed that of the 1,622,000 miles scheduled over twenty-six mail routes more than 1,500,000 miles were actually flown. Most of the lines boast of above ninety per cent performance. Here radio has played its part by being the dispatching medium providing constant communication between the plane in the air and the operating ground forces.

If, however, aviation is to be limited to transport uses and Army and Navy uses, it is destined to be but a small industry. The practically unlimited field of application for aircraft for both business and pleasure

precludes this possibility.

At the present time the number of privately owned planes other than those identified with flying schools is relatively small. In this field also radio affords an additional factor to encourage the more general use of aircraft by individuals, through offering to fliers one of the facilities that has made the widespread use of the automobile practical. On an automobile trip if one runs out of gasoline or meets with an accident in a little frequented place, it is nearly always possible to walk to the nearest telephone and call a garage or service station for help. Radio telephone for aircraft pro-



Transport lines equipped with Western Electric radio-telephone. Heavy lines indicate airways using two-way communication; light
lines show airlines on which planes receive weather and beacon signals only

vides this same facility for fliers.

The Aeronautical Division of the Department of Commerce under the Aviation Act of 1926 was authorized to establish weather radio broadcast stations and radio beacon transmitters in the United States. The weather stations collect weather reports and at definite intervals broadcast these reports, giving the condition as to weather, wind barometer, ceiling and visibility, not only locally but along the air route. Recently, the Department of Commerce has assigned two radio channels for direct communication between any airplane and any airport no matter where located in the United States. The radio channel assigned for the airplane for transmitting to the airport is 3106 kilocycles (a little less than ninety-seven meters) and for the airport the assigned frequency is 278 kilocycles (about 1079 meters). This latter frequency, which is in the same

band as the Department of Commerce weather and beacon broadcast transmitters, and the frequency of 3106 kilocycles constitute the "national calling frequencies" and are common to all except transport lines, to which

special frequencies have been assigned.

Naturally, with all airports operating on the same frequency, limitation of the power of the radio transmitter is imperative. Consequently the Department of Commerce has restricted the power of the airport transmitter to ten watts, which will cover a range of approximately twenty-five miles. A similar limitation has been placed on the radio transmitter for the plane.

These facilities are destined to be of inestimable value to the aircraft industr yas it grows. The airport operator will find the radio as an asset in directing traffic. Although the handling of incoming planes at an airport may not at the present seem to be a large problem, it is easy to imagine what difficulties it may present in the future. For the time being traffic control is handled by the waving of a flag or through some other visible signal—which may or may not be seen through the haze—or the blowing of a whistle or siren—which may or may not be heard and understood. Air shows during the last few years have demonstrated something of the probable difficulties—active salesmen primarily interested in demonstrating the merits

of their respective planes before a prospective customer; excited airport operators unaccustomed to such volume of traffic!—the scene has often been one of turmoil and not one cclculated to inspire confidence in flying in the hundreds of spectators.

With the radio in use, the field manager and his assistants can be located at a point of vantage giving them clear views of the airport and of all the approaching planes. At a signal from the field the operator knows for instance, that a plane is ready to take off from Runway Number One.



Airport radio telephone transmitter

At the same time he sees a plane approaching from the east preparatory to landing. With radio at his disposal, he merely talks into his telephone transmitter, as a railroad dispatcher does, "NX-710, please circle airport until further orders as plane is taking off from Runway Number One." After this plane has taken off, the operator may observe that another plane is approaching ready to land. He orders "NX-710, please come in on Runway Number Three. NX-5106, please circle field until further orders."

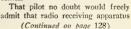
Simple and effective, of course. So much so that the Department of Commerce may shortly require airports to have this type of equipment before giving them a class "A" rating.

The owner of an airplane will likewise find the radio of value. We assume that the private owner of an airplane has acquired his ship either for pleasure or business or for both.

Flying entirely by compass is not easy. Allowances must be made for drift. Sometimes it is advisable to avoid a storm by circling it rather than to attempt to fly through it. To be sure, if the plane is purely a pleasure craft, it may not be used on rainy days, but after all at the rate of 100 miles per hour, it is possible to leave quickly the sunshine and run into the blackness of a storm. The pilot who uses his plane for business assuredly cannot be a "fair weather flier" only. His object in purchasing a plane is to provide himself with a medium for covering a large area in a relatively short time, so he will surely not want to limit himself to short hops in the immediate vicinity of his home airport.

Suppose that a private flier wishes to fly from New York to Washington. If the weather is poor, he can "fly the beacon" and by listening to the signal received from the Department of Commerce beacon stations know at all times that he is on his course. On the same frequency he also receives weather reports periodically. Reports of a sudden storm in Washington with low visibility might cause him to decide to wait at Baltimore until better reports come through. Or he might decide that the reports were favorable enough for him to complete his flight with the aid of the beacon. Arriving at Washington he may find considerable activity at the particular airport at which he

planned to land. He circles the field, looking for an opportunity to settle down but sees several other p'anes apparently with the same idea. Just as he has about decided to try another field, he hears in his head set "NX-710, it is your turn next. Circle field once, then come in on north-south runway. Runway good entire length of 3,000 feet. NX-520, stand by for further orders." And in he comes.





Radio telephone transmitter for private filer

## DECISIONS ON AIR LAW

THE American Academy of Air Law, through its official journal, the Air Law Review, reports that seventeen cases involving problems of aeronautical law have occupied the attention of local, state and federal courts during the first quarter of the year. Three were on the subject of right of eminent domain in the establishment of airports. one on bankruptcy, two on carriers, one the right of a purchaser at a judicial sale of an airplane subject to a chattel mortgage to attack the validity of the lien, six were on problems on taxation (five of these relating to the gasoline tax), one on insurance, one on criminal law and one on the workmen's compen-

In handling such a wide variety of cases the courts have, wherever possible, applied common law precedents to the legal problems arising in the development of this new mode of transportation. In certain types of cases such as those involving condemnation proceedings in creating airports and the gasoline tax, the result has turned on statutes. More specifically, the courts have handled various phases of the question of whether an airplane engaged in interstate commerce must pay a state gasoline tax. The problem of presumption of negligence in cases of airplane accidents remained an important subject of controversy. A test case has been sought to question the validity of state air traffic rules. A recent case has added one more interpretation to the respectable array of precedent arising in connection with insurance policies excluding recovery in the event of death in an airplane accident. The question as to the classification of airplanes in the category of motor vehicles has been judicially determined in the negative recently. Much litigation has centered about the Workmen's Compensation Laws of the various states. The courts have also dealt with many related problems.

The courts and the attorneys general of five other states have examined the validity of state taxes on gasoline consumed by airplanes engaged in interstate commerce. The decisions and opinions fairly represent the body of law which will be applied to the collection of gasoline taxes, since the statutes of those states from which the judicial interpretations have been forthcoming do not vary materially from those of the remaining states. The first decision bearing on the question arose in the Federal District Court in Oklahoma, and is known as United States Airways versus Shaw, 43 F. (2d) 148. The proposition there enunciated was that a state statute taxing gasoline used by airplanes engaged

in interstate commerce is unconstitutional. It was further held that where the interstate and intrastate business of an airplane transportation company is so commingled as to be inseparable, and to make incapable of apportionment a tax on gasoline, the gasoline consumed in the intrastate business cannot be taxed. The Shaw case immediately stirred up considerable controversy. The cases of Western Air Express versus Welling, decided by the Third Judicial District Court of Utah, and Midcontinental Air Express Corp. versus Lujan, decided by the Federal District Court of New Mexico, were in complete accord with the Shaw decision. The Florida Attorney General rendered an opinion in which he flatly disavowed the Oklahoma decision, and suggested that the Supreme Court would reverse it. However, a reversal seems impossible since the Oklahoma Attorney General expressed himself as content with the court decision, and unwilling to take an appeal. The Alabama Attorney General in a recent opinion distinguished the situation in Alabama from that in Oklahoma, and ruled that the Shaw case was inapplicable to a tax on all gasoline withdrawn from storage in the state for the purpose of sale. The Michigan Attorney General suggested that a tax on gasoline exacted for the privilege of using the municipal airports built and maintained by the state, and levied against only those airplanes which make use of these airports, should be a constitutional measure. The liability of an operator of an air-

The liability of an operator of an airplane for injuries to passengers has been in question in a number of recent litigations. A New York case, Seaman versus Curtiss Flying Service, has held that the mere fact of the accident is sufficient to establish presumptively the negligence of the operator. The judge presiding in the case of Foot versus Northwest Airways, tried in the United States District Court of Minnesota, Third Division, charged the jury that the defendant was bound to exercise the highest degree of care in the operation of the plane.

A litigation, the final determination of which is eagerly awaited, was begun in the Court of Special Sessions of Queens County, New York. The court, speaking through Justice Freschi, held that the state air traffic rules are not a burden on interstate commerce, and are not unconstitutional. The case is known as People versus Katz.

The case of Gibbs versus Equitable Life Assurance Society, decided by the New York Appellate Division, interpreted an insurance policy which provided for double indemnity in the event of death caused by purely accidental means excepting death resulting from "engaging as a passenger or otherwise in submarine or aeronautic expeditions." The court held that the estate of an airplane passenger killed in the crash of a plane may recover double indemnity, the exception being inapplicable to an ordinary passenger.

An interesting legal problem recently arose from the theft of an airplane, which was transported by the thief from one state to another. A United States District Court convicted the defendant under the National Motor Vehicle Theft Act. The Circuit Court of Appeals for the Ninth Circuit held that the defendant was properly convicted under that act. The Supreme Court of the United States. in the case of McBoyle versus United States, reversed the Circuit Court of Appeals, and held that the term "motor vehicle" in the statute does not include aircraft. The opinion was written by Justice Holmes.

#### AIRWAY MAPS

A SECTIONAL airway map showing nearly 50,00 square miles of
territory in the vicinity of Lake Michigan, and indicating airways and aids
to air navigation as well as topographical features within an area approximately 320 miles from cast to west and
150 miles from north to south, has
been prepared by the Aeronautics
Branch of the Department of Commerce, and is ready for distribution.

The map is the second of a series of ninety-two sectional airway maps, covering the entire United States, planned by the Aeronautics Branch in connection with its airways mapping program, which is handled by the Coast and Geodetic Survey of the Department of Commerce. The sectional airway map just completed is known as Upper K-16, Milwaukee, and the one previous-ty oublished is Lower K-16. Chicago.

On the Upper K-16, Milwaukee map, the airman will find the geographical locations of airports and landing fields: routes of the airways; the locations of beacon lights, intermediate landing fields and radio range beacon courses serving the Federal airways; railroads; Federal and other important highways; electric power lines; cities and towns; rivers and lakes; political boundaries; magnetic variation; and, in short, all necessary features that will aid in flying any course he may wish to take, whether or not it lies along an established airway. The region covered by this map is in northern Illinois, southern Wisconsin and southern Michigan.

## THE CHOICE OF A WING SECTION

THE selection of the wing section for a new airplane design constitutes a decision of great responsibility and consequence. It is not always feasible to continue using the same wing section as used before

the same wing section as used before or used by a competitor in a similar design. Change of the structural requirements may make that impractical. Even if possible, such a conservative policy may not be the best, and may retard progress and a most promising way to improvement. With each new design it is better to determine whether the wing section that first suggests itself is really the best suited, and if not, to consider the adoption of a better section. Such an examination should be carried on along broad lines. There has been some confusion caused by some older reports on the question of how to select a wing section. These papers are too specific and not broad enough. Penny wise and not pound wise. Artificial mathematical expressions and equations containing the coefficients ( different ones for the consideration of different performance characteristics) are developed and discussed, and laid down to serve as criterion for the merits of the wing sections. Such rules may be correct but they are not simple and are worthless from a practical standpoint. The very last percent of the performance does not depend on the wing section alone but on the whole design including the other parts of the airplane, and involving the interference between them and the wing. It is therefore useless to go into any detail for the selection of the wing section. The very simplest mathematics should

Of the many thousands of so-called wing sections investigated in wind tunnels, at least 90% must be condemned at first sight either because of the contours of the section or of a graph showing its aerodynamic properties. These wing sections will never become the section of a wing, and another name should be invented for them. Collection of data on such sections have a value which is chiefly academical, as they show how not to design a wing. Collections of data on the much smaller number wing sections that have a prospect of being used would be more useful for the practice.

be sufficient for picking out the best section and hardly any

computation at all is needed for that purpose.

We suppose the choice of sections to have been limited to such sections that appeal to common sense, and proceed to limit the number more and more until the one best suited to our needs survives. The first requirement of the section is its structural fitness. The designer has a rather distinct idea about the height of the spars he wants to place at definite positions, and the wing section must be spacious enough to accommodate such spars. This condition, particularly with cantilever design, considerably limits the number of the prospective wing sections.

Narrowing the choice further, the aerodynamic properties permit of a classification into three groups: General aerodynamic behaviors, stability, and performance. The first includes spinning properties and stability of the flow beyond the flying range. Some sections, while showing favorable aerodynamic properties, are extremely sensitive to small changes of their shape. They will prove as sensitive to interference of adjacent parts of the airplanes or of pro-

Article Fifteen on the Principles of Aerodynamics

Dr. Max M. Munk

truding fittings. Their airflow is just able to maintain itself against the disturbing effect of the friction, but the strength of maintaining has insufficient margin. It is not large enough to overcome additional disturbance from

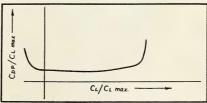
casual causes. This condition is generally discernible from irregularities in the variation of the air forces. The curves showing the relation between lift and drag or lift and angle of attack have bumps or even steps. The pressure distribution too, if determined, shows an irregular reharacter. Wing sections with irregular properties should be avoided because their choice involves a great risk. The irregularities near the small angles of attack are less dangerous than those at higher angles.

The lift characteristic beyond the maximum lift coefficient is as important. The lift coefficient should keep its value over a large range of the angle of attack as near the maximum as possible. If it falls off, it should at least fall off gently and continuously, by no means quite steep or even in a large sudden step. Such gentle decline will curb the tendency to spin or to drop one wing when flying at low speed.

Second in importance to spaciousness and aerodynamic cleanness comes the performance and stability. The latter refers to the travel of the center of pressure. An excessive travel brings about excessive structural loads, particularly in the diving conditions, and necessitates excessive control and stabilizing forces, resulting in heavy and long fuselages and large stabilizing and control surfaces. They again cause the performance to drop. The travel of the center of pressure should therefore be moderate, not too far in excess of the conventional.

A particularly small travel of the center of pressure or even a fixed center within the ordinary flying range is not of particular advantage, however; it is even harmful. Sections with fixed centers of pressure have that center close to 25% of the chord. This is farther forward than the most forward position of the center of pressure with moderate travel. The front spar is therefore highly loaded. Nevertheless the rear spar is not relieved by the lift distribution. At extreme angles of attack the center of pressure of these sections moves practically as far back as with ordinary sections. We have the paradox that the sections with fixed centers of pressure have the greatest travel of this center. There is also the travel caused by aileron deflection. On the whole it can be said that extremes in the travel of the center (extremes in both directions) should

(Continued on page 116)



## DEVELOPMENT OF THE HIGH-SPEED BURNELLI TYPE MONOPLANE

INVESTIGATION of the highspeed possibilities of the Burnelli monoplane verifies the Dr. F. Wertenson

sufficient to accommodate pilot and engines inside of the wing and.

contention that this plane is a practical application of the all-wing design to the need of the air transport industry for a high-speed multi-engined airplane with increased cargo space, and that its construction permits improvements in aerodynamic efficiency with an increase in size to meet the requirements of the future.

The ideal all-wing type of airplane would incorporate only wing formation utilizing all power output for lifting purposes, there being no parasite drag.

Table 1 illustrates the degree of power efficiency increase that would accrue if an ideal flying wing were practical. The power breakdown as applied to the Burnelli monoplane indicates that the wing horsepower required is 42 per cent of the entire power required which is indicative of the degree of flying efficiency that could be achieved by a wing only,

The size of airplanes will have to increase substantially before the wings reach such dimensions as to provide suffi-

cient space for passenger accommodation without extensive wing distortion. This does not take into account other essential structural considerations at issue. For example, the thickness at the wing root of one of the largest cantilever thick wing designs with 96 feet wing spread is less than four feet. Assuming the same tail length and areas, the structural and accommodation difficulties without fuselage are readily evident. In order to overcome these difficulties some futuristic designs taper the wing extremely to achieve large wing ordinates on the center section for necessary cabin height and to obtain wing chord extension to facilitate tail group and tail wheel support. Despite the increased center section. the resulting wing thickness is not

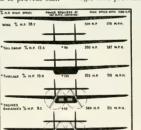


Figure 1. Aerodynamic structure of Burnelli high speed design. The figures illus-trate the power breakdown of wing and parasite resistance of a high speed Burnelli type with two 600-horsepower engines, 12,600 pounds gross weight

with a view to obtaining the necessary space, airfoils of extraordinary thickness ratio are employed. Yet, withall this design does not eliminate protrusions of cockpit and engine housing which add further

The Burnelli design is a compromise achieving aerodynamic advantage in combination with practical requirements. It consists of two wing panels of ordinary dimensions attached to a center section of considerable width for multi-engine installation and sufficient chord to provide height to cover engines, cockpit and passenger cabin. Usual thickness ratios can be applied for the center section as well as for the wing panels, and the frontal area of the plane is less than that of a flying wing with comparable accommodations. It also has important structural advantages. The body length provides favorable conditions for

the installation of tail wheel and mounting of tail group.

Windows can be arranged in the sidewalls below the

wings, thus providing satisfactory vision, whereas, in comparison, passengers in a flying wing have only a limited outlook through floor and windows in the entering

> In the development of the Burnelli design, the main consideration was the proper coordination of the airfoil fuselage with the wing panels in regard to lift and drag ratio and center of pressure run: to place properly the body and to locate the tail areas with respect to downwash and to provide ground clearance for high angles to attack with a very short landing gear. The present design resulted after a systematic wind tunnel investigation pertaining to the aerodynamic cooperation of wing body and tail group. The full scale stall speed tests indicate that at high angle of attack the body has as much lift as

| TAB | BLE 2. | DRAG | COEFFICIENTS | RELATED | TO FROM |
|-----|--------|------|--------------|---------|---------|
| AT  | AREA   | FOR  | AIDEOUS OF   | VADVING | THICKNE |

| Symmetric                             | Joukowski         | airfoils         | (NACA rep         | . Reynold         | 's no. abou       | t 106)                     |
|---------------------------------------|-------------------|------------------|-------------------|-------------------|-------------------|----------------------------|
| Thickness ratio:<br>Drag coefficient: | 5.51%<br>.000290  | 10 4%<br>.000210 | 15.06%<br>.000168 | 20.69%<br>.000147 | 27.26%<br>.000141 | 32. <b>70</b> %<br>.000164 |
| Clark Y                               | airfoils (        | Air Cory         | s rep. Rey        | nold's no.        | about 105.5       | )                          |
| Thickness ratio:<br>Drag coefficient  | 12.9%<br>: .00024 | 1                | 15%<br>.00021     |                   | 8%<br>00208       | 21%<br>.00020              |
| Double camber                         | ed M sect         | ions (N/         | ACA rep. 22       | 1. Reynol         | d's no. abo       | out 106.5)                 |
| Thickness ratio                       | 6.15%             |                  | 8.                | 21%               |                   | 12.01%                     |

Frontal area coefficients converted from wing area drag coefficients. The advantage of low linewess ratio for minimum drag is evident,

TABLE 3. DRAG OF RADIAL ENGINE INSTALLATION

| Installation                                       |                                | Pounds<br>drag<br>with<br>smooth<br>nose at<br>100 m.p.h. | Pounds<br>addition<br>with<br>cowled<br>engine | Pounds<br>total<br>drag<br>with<br>cowled<br>engine |
|----------------------------------------------------|--------------------------------|-----------------------------------------------------------|------------------------------------------------|-----------------------------------------------------|
|                                                    | . ft. master section (NACA     |                                                           |                                                |                                                     |
| rep. 313)                                          |                                | 40<br>42                                                  | 35<br>31<br>22<br>20                           | 75<br>75<br>43                                      |
| Open cockpit fuselage                              | alone (NASA rep. 314)          | 42                                                        | 31                                             | 75                                                  |
|                                                    | ACA rep. 314)                  |                                                           | 22                                             | 43                                                  |
| Nacelle in line with v<br>Burnelli airfoil section | ring (NACA tech. note 320)     |                                                           | 20                                             |                                                     |
| engines (NYU wind                                  | tunnel test 541 A), per engin- | e 🕮                                                       | 18                                             |                                                     |

All tests are related to a cond dismeter of 46 inches: In comparing the drag of the nacelle alone with the drag of the nacelle clien files with the wings it must be borne in mind that for the nacelle alone 22 pounds means the drag in excess over that of the streamline nacelle body is the mose of which the engine costs over that of the streamline nacelle body is the mose of which the engine with the wind that the streamline of the drag of one craims, while for the nacelle in line with the wing only 30 points and with the Winterfil 18 pounds must be added.

#### TABLE 4. EFFECT OF FUSELAGE AND WING INTERFERENCE

| (Goettingen | wind   | tunnel | tests  | Ergebais | e 1.) |
|-------------|--------|--------|--------|----------|-------|
|             |        | K      | y max. | Kx min.  |       |
| Wing alone. |        |        | .00304 | .0000348 | 87    |
| High wing 1 | paraso | 1      | .00314 | .0000486 | 65    |
| High wing   |        |        | 00311  | .0000417 | 74    |
| Midwing     |        |        | 00302  | .0000417 | 72    |
| Low wing    |        |        |        | .0000443 | 68    |

| Wing | belo  | w fus | elage    | 00302    | .0000 | 1537 | 56   |
|------|-------|-------|----------|----------|-------|------|------|
| (    | NPL   |       | tunnel   |          |       | A.   | S.   |
|      |       |       | Journal  | . 1930.) |       |      |      |
|      |       |       | fillets. |          |       |      | 37.7 |
|      |       |       |          |          |       |      | 35.2 |
|      |       |       |          |          |       |      | 31.5 |
| .ow  | wing. |       |          | 00228    | .0000 | 1855 | 27.0 |

In both tests the ratio of K<sup>T</sup> max, over K<sup>2</sup> min, figure of merit for high speed indicate min, figure of merit for high speed indicate other tests the low wing plane occasionally shows better lift characteristics than in these and simultaneously increased drags. Usually the plane with the sensitive airflow on the speed of the single control of the sense of th

the section of wing it replaces. Further wind tunnel tests gave information on the effect of the body shape in plan and sideview as to maximum lift. A co-efficient of .0020 being achieved at landing angle, the wings are adjusted to the body at a positive angle of incidence so that at high speed the body flies at the angle of minimum drag and zero

lift while the angle of attack of the wing panels then is higher at cruising speed than that of ordinary planes and closer to the angle of best lift over drag ratio. At low speed the full lift of the body is effective, therefore the body functions as additional wing area at landing speeds, permitting corresponding reduction of the area of the wing panels. After establishing the cooperation of wing and body, effort was directed towards reduction of resistance of the appendages,

i. e., fuselage, pilots' cockpit, engine housing, cooling means

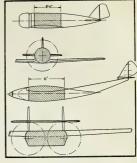
and tail suspension.

Structural and aerodynamic conditions of the Burnelli fuselage are singular. In its development, it is necessary to consider it aerodynamically as a fuselage of high width to height ratio as well as a wing of low aspect ratio. Table 2 interprets wing drag coefficients into frontal area values. The frontal area values of the airfoils most suitable for the purpose indicate .00016, approximately as the minimum drag that can be achieved with an airfoil section body. Wind tunnel values of .00025 with engines and cockpit are obtained without rounded sides. Further, in accordance with tests on dirigible hulls and strut sections, a relatively short body (fineness ratio 4) gives the least resistance due to skin friction. In later development the airfoil

section body was shortened to a fineness ratio of approximately five, the limiting factor being the necessary distance between front wheels and tail wheel which at present corresponds to short coupled amphibions. The tail group is carried rearward and upward by fin extensions.

Extensive experiments were conducted to determine the resistance of the engine housings and cooling system. The primary consideration was to keep the shape of the body and its aerodynamic characteristic as close to that of a wing section as possible. Both water cooling and air cooling systems were tested in different arrangement

and outlet directions. N. A. C. A. cowls, adapted to the twin-engine installation, increased the drag very little; the drag coefficient increased obtained being only .00008 over that of the fuselage with smooth nose. This is considerably less than with wing motor installations, as shown in Table 3 and indicates the high degree of efficiency obtainable with



Comparative cargo space distribution

relation to wing sections is intricate, as it is not alone a consideration of drag, but also of lift, propeller efficiency, cooling and structural condition. Early tests of the N. A. C. A. cowl (Report 313 and 314) gave information on how to obtain minimum drag with sufficient cooling, the main object being to establish drag reductions compared with the uncowled radial engine. In fact, the results achieved indicate that the entire drag of an N. A. C. A. cowled radial power plant is comparable with that of the equivalent water cooled systems of other than the most advanced developments such as venturi, Prestone and skin cooling. It is not alone the drag of the engine that affects the airplane total drag, but also interference effect with relation to wings. According to wind tunnel tests, the

Burnelli design is not subject to this drag increase. Recent tests have shown the advantageous effect of merging the

nacelle in wing section for minimum drag. A cowled

engine alone had 43 pounds of drag, while the same nacelle

merged in line with the wing gave only 20 pounds addi-

radial engines. The problem of radial engine installation in

tional at high speed, and 30 pounds at low-speed incidence.

Further experiments con-

to a fineness ratio of ap- TABLE 5. POWER ECONOMICS OF BURNELLI AND cerning the influence of proximately five the limit.

HIGH SPEED SINGLE ENGINE DESIGN

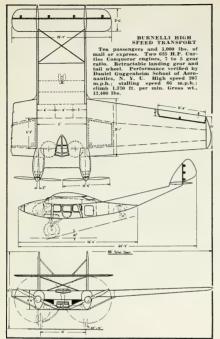
proximately five the limit.

In the following fuselage resistance and space comparison both planes carry coulal power load, use the same wing section, have the same landing speed, cual propeller tip speed and are equipped with retractable landing gear and tail when

|                                                              | line.<br>Single<br>Engine |        |
|--------------------------------------------------------------|---------------------------|--------|
| Horsepower                                                   | 425                       | 1,200  |
| Frontal area of fuselage, square feet                        | 17.5                      | 50     |
| Horsepower per square foot of frontal area                   | 24.2                      | 24     |
| Cargo space, cubic feet                                      | 135                       | 550    |
| Horsepower per cubic foot of cargo space                     | 3.14                      | 2.12   |
| Drag coefficient of body ideally faired (Kx)                 | .00016                    | .00022 |
| Engine and cooling system (Kx)                               | .00030                    | .00030 |
| Lift coefficient of body (Ky)                                | _                         | .0020  |
| Equivalent wing area saving, square feet                     | _                         | 140    |
| Equivalent resistance saving, flat plate                     | _                         | 1.22   |
| Resulting comparative body resistance equivalent flat plate  |                           |        |
| per 100 HP                                                   | .385                      | .290   |
| Percentage of engine power required by body at 190 m.p.h.    | 28%                       | 21%    |
| Engine power required at 190 m.p.h. per 100 cu, ft, of cargo |                           |        |
| space                                                        |                           | 46     |

The frontel area per horseptoner is about equal, also, the retistance confiring to with power bodies intelled, therefor, the retistance per horseptoner. This is the twin contine Surveill, winto section body as verified is allowed for by subtracting the drug of the envisedent wind area replaced by the same. This excusts in 25% less drug per horseptoner and in the much lower power of 46 horseptoner of 19 100 cubic feet of cargo space at 190 miles per hous.

nacelle location in reference to the wing and effect on maximum lift and propulsive efficiency was carried out here and abroad. Previously, only scattered data were available concerning wing and propeller interference tests having yielded varying results. Very little could be determined from empirical data as to lift influence with power on or idling propeller. In general, the opinion was accepted, however, that the farther the propeller was from the wing, the better. In contrast, more recent experiments disclose that to have a propeller operating in proximity to a



thick airfoil section, the hub in line with the wing and moderately forward of the leading edge is superior in allround efficiency. This solution of propeller arrangement recommends housing the engines in a wing section to eliminate drag and opens the path for airplane advancement by following the all-wing trend of design.

While substantial progress has been made pertaining to air-cooling drag reduction it has been paralleled in the refinement of water cooling drag; partly through venturit cowls for the radiators and outlet flow, and through the use of skin-cooling, which eliminates cooling resistance almost entirely; but mainly through introduction of Prestone high-temperature cooling, which reduces the radiator area to one-third. Practice has proven fuel consumption and durability satisfactory and that considerable weight reduction is possible. Its application to high-speed commercial designs undoubtedly will assist materially in their development.

The wide body of the Burnelli plane permits of the installation of radiators with venturi cowl with outlet flow parallel to the under surface. This arrangement does not add to the frontal area and, according to recent model tests, only slightly increases the resistance of the ideally shaped airfoil fuselage. A series of wind tunnel tests was run on a model of the UB 20-passenger plane with

two 750 horsepower Packard engines. The free air radiator required for water cooling 1,500 horsepower would absorb at 160 miles per hour over 250 horsepower; while the venturi cowl type in the entering edge with outlet at the bottom consumes with equal cooling less than 50 horsepower. Further attention has been paid to a combination skin-and-fin-type radiator covering the body entering edge, an adaptation of the Lamblin method, following also along the Supermarine racer cooling investigation, which disclosed surprisingly high cooling effect at the entering edge of wings because of the high velocity impact of the air.

Landing gear and empennage represent major items of parasite resistance to be overcome before the true all-wing design can be realized. The empennage averages about 10per cent of the total drag and may be assumed to be an unavoidable resistance increment. While certain tailless airplanes have been developed, the new control arrangement has been attendant with lower wing efficiency. Landing gear and tail-wheel drag elimination by retraction permits the most extensive reduction of parasite resistance that can be achieved by mechanical means. It accounts for about 20 per cent of the total drag of high-speed planes. The wide fuselage design is excellent in that it provides space and structural suitability for wheel retraction with a simple mechanism accessible from the pilots' section. The performance increase through landing-gear retraction is considerable, as indicated in table 1, which also illustrates the resistance of engine cowling and cooling system. Reduction of powerplant and landing-gear resistance represents the principle advancement in airplane design in recent years.

Tabulated performance figures are high; they give the performance of a Burnelli high-speed plane which was developed from the research covered in this resumé. The underlying resistance coefficients correspond to advanced streamline design, in accordance with those which can be obtained from analysis of the actual performance of contemporary single-engined commercial designs. The present fast commercial planes are equipped with tapered cantilever wings with Clark Y airfoil, a radial engine of 400to 500 horsepower with N. A. C. A. cowl and a round fuselage, the master section of which is very little in excess of the frontal area of the engine. A low-wing monoplane of this type with an orthodox landing gear achieves a high speed of 175 miles per hour, whereas the corresponding high-wing plane which has even more frontal area achieves 180 miles per hour. This difference is caused by the interference of the fuselage with the sensitive air flow on the upper surface of the wing of the low-wing type, which affects the induced drag at low speeds and the form drag at high speeds.

Table 4 pertains to the relative merit of wing location based on tests at Goettingen and NPL. Through further refinement, particularly of the landing gear, it was possible to increase the high speed of the high-wing for racing purposes to 198 miles per hour, while application of landing gear retraction and other refinements increased the speed of the low-wing monoplane to 206 miles per hour. The high-wing gear could achieve 215 miles per hour. The high-wing type, which in this connection is superior aerodynamically, is not comparable to the low-wing in its structural adaptability for retraction of the landing gear.

(Continued on page 120)

## **OUR READERS AIR THEIR VIEWS**

E. R. Armstrong, with paternal interest in seadromes, comes to the defense of the floating airport:

Captain Courtney, writing on "Trans-Atlantic Air Mail" in your August issue, said: "The idea of floating air stations placed in the Atlantic is being tackled, but they are experimental."

The Armstrong Seadrome, which, so far as I know, is the only practical floating airport in project, has graduated from the experimental stage. We are satisfied with its practicability and have the assurance of the hest engineering minds in America and Europe that seadromes can be successfully anchored and maintained in the ocean. They and nothing else. I believe, will answer the question of trans-Atlantic travel, which, as Captain Courtney points out, hinges on short hauls. He says, "The greatest problem of all is that of load, for the service must be such that it can carry something appreciable in addition to fuel," I would be glad to explain to Captain Courtney exactly how we propose to solve this problem.

Paul N. Hepburn, president of the Los Angeles Glider Club, believes that gliders fly against a lot of unnecessary resistance in the form of Governmental regulations:

What has become of all the gliders? In my opinion, gliding, which not long ago had a promising future, is being throttled by unwise regulation.

Many regulations have been formulated by the Department which encourage the development of gliding as an industry, but which practically eliminate the building and flying of motorless craft as a sport. Yet I do not believe that gliding and soaring and the manufacture of gliders and soarers will ever be commercially successful. The sport is not as simple as it sounds. As an example let me explain the system used by the Los Angeles Glider Club in its gliding operations. The minimum equipment required is a glider, an automobile, a launching cord consisting of two hundred feet of rope and one hundred feet of shock cord doubled, a retrieving sled and four men.

We fly from a hilltop and get an average hop of two minutes. Four hops an hour is about the best we can make; that is two minutes in the air and thirteen minutes retrieving and preparing for the next hop.

Only those men who are extremely fascinated with the sport will stand the physical and financial strain for long. The queer thing about it is that there are quite a few men interested in the game despite its difficulties.

The point of all this discussion is that we who are interested in gliding are interested, not for any monetary gain we have made or expect to make, but purely for the sport of the game. And if flights are accomplished in a machine which the pilot has designed and built himself the thrill is mul-

tiplied many times. I believe the youth of this country can receive valuable training and experience in motorless flying that can be given them in no other way; but, they will not receive these benefits if the sport is commercialized and regulated to death.

I do not mean that gliders and gliding shall not be regulated at all. All gliders ammufactured by any company or person and intended for sale to the public should be built under, and comply with the regulations of the Department of Commerce, but any individual who so desires should be allowed to design and build his own glider. The glider upon passing a visual inspection by a competent representative of the Department of Commerce for workmanship and material and apparent airworthiness, should be issued a permit to fly.

The so-called home-made glider always is blamed either directly or by insinuation for any crash. I have seen five different makes of manufactured gliders and have yet to see one that will surpass or even equal our self-built machines, either in design, quality of material, workmanship or performance.

If the Department of Commerce will remove the throttling regulations that are smothering the amateur glider builders and fliers, they can do their stuff. They have proved they can do it if they are not prevented by these silly, prohibitory requirements.

R. K. Squire suggests that aviation abandon the tin cup in favor of a selfassertive sales campaign, and gives a tip on merchandising of air transport:

Here is a little matter of sales psychology that I believe you may want to bring to the attention of the industry.

First, cut out this "Boost Aviation" propaganda. It sounds too much as if aviation couldn't stand on its own legs, like "Please do your part to help the poor." Rather, get out posters and literature in this trend: "Aviation is a real business; get in now!"

Second, how can the average person be expected to travel by air when he seldom sees an airliner? To sell the average man travel by air is just as hard to do as it would be to sell a backwoodsman an automobile if he had never seen one. There are plenty of airplanes flying anywhere we want to go, but most people don't know it. Most airlines operate from an airport about ten miles from the center of town and never have their planes fly over the populated area; people don't know they are there and don't realize how often they fly. If one sees a lot of other people doing a thing, then he figures he can do it safely

Even if it is a few miles out of the way, every airliner coming into or leaving a

city should fly over the downtown area and let people see it. That is just a bit of real sales propaganda that would cost very little and would bring results.

Conrad G. Glaser points out that invention is floundering in a sea of discouragement and suggests a plan for getting it on dry land:

I wish to suggest a plan for the encouragement and promotion of invention.

I feel it should not require much explanation on my part to make it clear that there is little to encourage, and very much to discourage, invention.

Along with almost all who have in mind to patent and develop an invention, I fail to see reasonable safety and hopes of reward for creative labor. This feeling of doubt and insecurity in the inventive mind may be more or less exaggerated; be that as it may, the important point to consider is the fact that it does exist, and so long as it does, this most important field of production will remain very inefficient.

When an inventor conceives a new idea the usual procedure is to have an attorney, patent firms, and the like handle the case. Whether it is safe to trust an attorney, patent firm, or any other individual in making a preliminary investigation of its patentability, is a question on which no inventor can feel secure.

Another discouragement to the inventive mind is that the usual search to determine the patentability of an invention is not complete, and an invention may even be pronounced patentable merely in order to secure attorney fees. An inventor must therefore always labor more or less under the impression that all the time, money and effort he puts forth may be a total loss.

My plan is this: that when an inventor has the principle of his invention sufficiently clear and in proper form, he should submit it directly to a Government search department. The search should be complete, and if patentable a notice of patentability should be issued to the inventor.

I believe it would also be a good plan for the Government to offer a preliminary search for a smaller fee than that required for a complete search to fully determine patentability. In this case inventors would often find at once their ideas unpatentable. A simple sketch or drawing, submitted at a cost of five or ten dollars for making preliminary search, would thus save much time and money in experimentation with models and other devices.

The inventor should then be allowed one year in which to file application for patent.

I am convinced the number of inventions developed under this system would soon be double what it is at present, and that the Government, patent firms, attorneys—in fact, all concerned with the development of invention—would benefit enormously.

## THE NAVY AIRSHIP "AKRON"

THE world's largest dirigible, the ZRS-4, christened the U.S.S. Akron, has been completed in the plant of the Goodyear-Zeppelin Corporation, Akron, Ohio, and will take to the air for extensive trial flights.

During the latter part of August or early in September, a Navy crew, under the direction of a Naval board of inspection and survey, was to begin a series of tests to involve at least seventyfive hours of flying to be carried out in at least five separate flights.

The tests include speed trials, altitude trials, measurement of turning circles and dynamic lift, a study of interior ventilation and pressure equalization and of deflections and strains within the structure, and of various other scientific considerations.

The final trials culminate exacting tests at each step of the building of the great dirigible.

Throughout her construction various parts of the Akron and her equipment have been critically examined to prove their suitability. Step by step all parts have been tested. The first section of the airship to be completed was a section near amidships. This section was subjected to a proof test, using for this purpose an appropriate gas cell, inflated with helium so as to simulate actual conditions as closely as possible. Various loadings were applied to this section and scientific measurements were made. The behavior of this critical section of the airship was according to calculations. Hundreds of tests of smaller magnitude have been made on girders, joints, fittings, fins, rudders and various items of installation and equipment. As the airship approached completion other ground tests were made, including hogging and sagging tests, inclining tests, electrical bonding and insulation tests, testing of fuel lines, control systems and other ap-

The design of the Akron represents a special effort to stress safety from every standpoint. Structural integrity, accessibility for repairs, insurance against breakdown of any essential operational feature, protection against fire and means for extinguishing fire are some of the major safety features of the airship's design.

The history of the design of the Navy's newest airship goes back to 1924. The Shenandoah had been completed and the Los Anacles had been delivered from Germany. There was no immediate prospect of building additional airships, but in order to keep abreast of progress and to be ready with a modern design when and if necessity arose, the Bureau of Aeronautics commenced preliminary work on the design of an airship of about six million cubic feet gas volume. This size was chosen because, using helium for inflation, it gave an airship of dimensions



P. W. Litchfield, president of Goodyear-Zennelin Corporation

that would fit into the Lakehurst shed; an airship that could cross and recross the Atlantic at cruising speeds without refueling; and an airship of performance which compared with the two British airships of five million cubic feet volume and inflated with hydrogen. The work on this new design was the medium for detailed technical consideration of various hull shapes, types of girders, types of main frames, most advantageous spacing of frames, various arrangements of engines and gas cells, and other problems of airship design. The general design work was reinforced by wind tunnel tests on models and by full scale tests on the Los Angeles, as well as by studies and experimental tests on various elements, such as girders and materials.

After the loss of the Shenandoah in 1925, it was considered desirable very markedly to increase the strength requirements hitherto in use in airship design. It was decided to increase slightly the size of this airship to about six and one-half million cubic feet and to make the strength of the airship such that she could withstand conditions two to three times as severe as those sustained by the Shenandoah.

In 1926 a bill was introduced in Congress by the late Representative Thomas M. Butler, then Chairman of the Naval Affairs Committee, to authorize the building of an airship to replace the Shenandoah. Hearings were started and the airship question studied exhaustively. Lighter-than-air problems were considered as well and as a result of these hearings the Five Year Aviation Program Bill was passed. Included in this bill was authorization for construction of two rigid airships of about six and one-half million cubic feet volume to be

suitable for use with the Fleet. Funds for starting construction of these airships were not immediately available, but finally did become available in 1927.

In the interest of encouraging the establishment in the United States of an airship industry, it was decided that bids should be called for through a design competition rather than to build the new airships in the Navy Department's own plants as has been done in the case of the Shenandoah. The design which was then underway in the Bureau of Aeronautics was used as the basis for the preparation of a set of technical specifications describing a type of airship suited to Naval purposes. They were purposely made broad so that they might be fulfilled by any one of several designs. These technical specifications were used in the two design competitions which preceded the award of contracts for two airships to the Goodyear-Zeppelin Corporation in October, 1928. These specifications have been adhered to very closely, although naturally there have been departures in details from these specifications as the Goodyear-Zeppelin Corporation proceeded with detailing the design submitted by them and accepted under the 1928 Airship Design Competition.

The general appearance of the Akron is similar to the Los Angeles and other airships of the type. Some of her outstanding features are:

A fatter shape, her length being 5.9 times her maximum diameter.

Rather large stabilizing fins.
A single, rather small, protruding con-

trol car.

Eight internal engine rooms which

Eight internal engine rooms, which eliminate the pendant external power cars heretofore customary.

Eight propellers suspended from outrigger struts with means for tilting each propeller, so as to give thrust in four directions.

An internal hangar, for housing four or five airplanes.

Resilient bulkheads for checking surging of the gas cells in case one is deflated

Use of combined automatic and manually-operated gas valves.

Provision of special points at the bow for mooring the airship and under the lower fin for supporting the stern of the airship during ground handling opera-

Easier and better access to all parts of the interior of the airship.

Provision of machine gun emplacements.

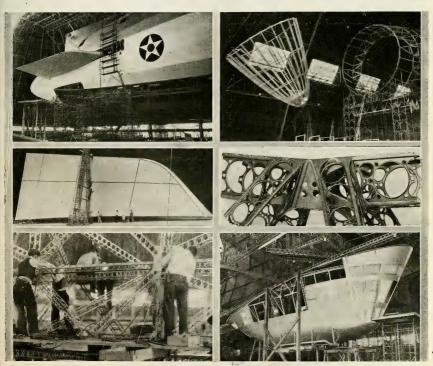
The Abron is constructed on the orthodox multi-layer principles which have applied to rigid airship construction, particularly of the Zeppelin type, during the past quarter of a century. The basic hull structure is a wire-braced system composed of transverse frames connected by

longitudinal girders. The number of longitudinals is thirty-six, except near the ends of the airship. In general, three intermediate frames are located between each two main frames. These longitudinal corridors, or gangways, one on the top center line and two in the lower part of the hull, give the structure additional ruggedness. The engine rooms are located along the lower corridors. The gas cells, twelve in number, are placed inside of this hull structure, one gas cell being located between each pair of main frames. The gas cells are enclosed in a system of wire and cord nettings which serve to transmit the gas forces to the hull framework. A taut outer cover of cotton cloth is applied and given several coats of acetate dope to protect the entire hull structure against atmospheric influences and to offer a smooth hull contour. Thus, if we start from the exterior and peel off successive layers, we would remove, first, the outer cover; second, the hull structure; third, gas cell nettings: fourth, the gas cells themselves, constructed of cotton cloth and made impermeable to passage of gas; and finally, the helium gas itself which gives the airship its lifting power.

The powerplant selected for the Akron comprises eight Maybach model VL-2 gasoline engines, which type is a development from the 420-horsepower Maybach engines installed in the Los Angeles in 1924. The VL-2 engine carries a sea-level rating of 560 horsepower at 1,600 revolutions per minute, with a compression ratio of seven to one. The engine is a twelve-cylinder, sixty-degree V-design, water-cooled powerplant with aluminum pistons and crank case. All bearings are anti-friction, the main and connecting rod bearings being of the roller type. Compressed air is used for starting. Reversibility is obtained within the engine itself by having both an ahead and an astern set of cams on the cam shaft which may be shifted longitudinally to bring either set into operation. The weight of this engine, dry, is approximately 4.5 pounds per horsepower. Fuel consumption is about .45 pounds per horsepower of power.

Each of the eight engine rooms on the Akron has a floor space of about eight by eight feet. The engines are mounted athwartships and each engine drives its own propeller, through a sixteen-foot transverse shaft which carries at its outboard end a tiltable housing from which the short propeller shaft protrudes. The short propeller shaft, normally horizontal, may be swung downwards through ninety degrees in a few seconds by means of a hand wheel located in the engine room. This feature, coupled with the reversibility of the engine, permits thrust to be obtained in four directionsahead, astern, upwards, and downwards. An upward thrust of about 6,000 pounds and a downward thrust of about 10,000 pounds are expected to be of assistance in mooring and handling the airship. When the airship is in normal flight, it will be more economical to obtain vertical movement of the airship through the use of the rudders rather than resort to the tilting propellers.

Each engine room contains equipment which includes the following features:



Views showing details of construction of the world's largest airship

engine instruments, oil service tanks and a specially built blower to supply fresh air for intake purposes, crankcase ventilation and ventilation of the engine room itself. Signals which guide the engine mechanic in controlling the engines are received from the control car by a mechanical telegraph or indicator. Gasoline storage tanks are located in the corridor nearby and feed by gravity to the engine carburetor. The engine rooms are carefully fire-proofed and each is provided with an automatic carbon dioxide fire extinguisher, in addition to hand-type fire extinguishers and other fire protection apparatus located in the engine rooms and immediately adjacent thereto

The transmission gearing which connects each engine with its propeller includes a speed reduction of .578 so that 1,600 revolutions per minute at the engine crankshaft are reduced to 925 revolutions per minute at the propeller. The weight of this transmission gearing is approximately 1,600 pounds, and its mechanical efficiency is estimated at ninety-seven per cent. This transmission gearing has been subjected to a very careful endurance test of more than 300 hours, during which its torsional characteristics have been thoroughly investigated with the result that any possible dangerous peak of torsional vibration is believed to have been located and placed outside the operating range of the power-

The two-bladed, wooden tractor propellers are about sixteen feet four inches in diameter, and are designed to take into account the effect on their efficiency of the multiple tandem arrangement which results from having four propellers on each side located approximately in the same horizontal line and seventy-four feet apart.

Engine radiators will be of the ordinary core type mounted on the outriggers which carry the transmission shaft. To give some measure of cooling when propellers are acting vertically, supplementary cooling arrangements in

the form of horizontal finned tubes have been provided.

The usual method employed in the United States to preserve equilibrium of a helium-filled airship, and thereby to avoid the necessity for valving buoyant gas as fuel is consumed and the airship tends to become light, is to employ a water recovery apparatus which condenses the moisture content of the engine exhaust to water and retains the water so recovered on board the airship as ballast. Theoretically, it is possible to recover 135 pounds of water in this manner for every 100 pounds of aviation gasoline that is burned, but this figure will vary according to several factors. The water recovery apparatus on the Akron represents an effort to install the apparatus close to the hull of the airship, thereby making it somewhat of a skin-type condenser, reducing its drag or resistance. The apparatus comprises five panels mounted close to the hull above each engine. Each panel consists of horizontal aluminum tubes connected by vertical headers. The flow of gas initially is upwards and the condensed water is drawn off through by-pass pipes and circulated to fabric bags throughout the airship.

The normal gasoline supply of about 124,000 pounds is stored in a total of 110 aluminum tanks of three sizes, the majority of them being of 120-gallon capacity. These tanks are located alongside the two side corridors, convenient to the engine rooms, and are so arranged as to trim properly the airship. A rather extensive system of piping, principally aluminum, permits fuel to be received at the bow or near amidships and to be circulated at will. Fuel may be shifted in flight from one container to any other container. Oil is stowed in eight 1,500-pound-capacity tanks, one being located near each engine room.

The ballast system comprises some forty-four rubber fabric storage bags of several sizes connected by a system of piping. Each of these bags is equipped with a quick-discharge valve which can be operated through a wire pull leading

to the control car. Certain of these ballast bags are located near the bow and stern of the airship and serve especially as emergency ballast and for correcting the trim of the airship. The remaining bags are located along the length of the airship and may be used in the same way for emergency purposes, but their major purpose is to serve as storage bags for recovered ballast water.

Each gas cell is a fabric cylinder dimensioned to fit its particular location in the airship. The largest cell is near amidships and has a capacity of some 980,000 cubic feet of helium. It is seventy-four feet long and approximately 130 feet in diameter. One-half of the cells in the Akron will be made of twoounce cotton cloth coated with several layers of rubber and a final coat of paraffin. The other half of the Akron's cells will be made of an improved and somewhat more expensive fabric which is made up from two-ounce cloth coated with several layers of a mixture of gelatin and rubber latex, with a final coat of paraffin. The final weight of gas cell fabric is between 5.5 and 6.5 ounces per square yard. The total amount of cloth in the gas cells is about 56,000 vards.

Gas cells are located along the upper corridor and are either fully automatic or a combined automatic and manuallyoperated type. The manual operation is by means of wire pulls leading to the valve control switchboard in the control car. The valves are thirty-two inches in diameter and the number of valves is arranged so that the airship may rise at a rate of 4,000 feet per minute without causing serious increase in internal pressure. Adequate openings are provided in the hull covering so that pressure inside the hull may equalize quickly as the airship ascends or descends. In the plane of each of the main frames there is a slack bulkhead of hard wires, which looks very much like a spider web. These bulkheads are located between the gas cells and are fitted with a resiliency device (gas-filled cylinders) so that some bulging of the bulkhead may take place in the event a gas cell pushes against it, and serious torsional loads in the main frames will not thereby be built up. In order to take care of possible bulging of gas cells, extra material has been provided in the circular ends of the gas cells abreast the resiliency device.

The outer cover of the Abron is made up from 2.8-ounce cotton cloth, sewed into panels approximately seventy-four feet long by either twelve feet or twenty-four feet wide, bounded by an eyel-lacing edge. These panels are laced into position and secured to the hull framework and to special supporting wires. The panels are then given four coats of acetate dope, the last two coats of which contain aluminum powder. The final weight of the outer cover is approximately 5.3 ounces per square yard, and a total yardage of about 36,000 square yards is required.



The "Akron" as it neared completion

The Akron contains an electrical plant and system which is substantially a miniature reproduction of similar systems used on destroyers, submarines and other vessels. Power is needed for radio, lighting, telephones, a portion of the cooking, and for certain pumps, winches, fans, etc. The main source of power is two 8 K.W., 110 V., D.C. generators, each driven by an independent gasoline engine. These two generators may be paralleled in operation. In addition, there is a small reversible dynamotor and a 130-hour, twenty-four-volt storage battery. All of this equipment is installed in a fireproof generator room located immediately adjacent to one of the forward engine rooms.

The radio outfit was built to specifications developed by the Bureau of Engineering. It comprises an intermediate frequency transmitter (300-605 kilocycles) and a high frequency transmitter (3,000-18,100 kilocycles) and is expected to show a transmitting range on high frequency of at least 5,000 nautical miles, and on intermediate frequency of at least 500 nautical miles. Approximately 500 watts' antenna input is contemplated for each transmitter. In addition, there is a light-weight radio compass. Facsimile equipment will be installed later. Trailing wire types of antenna are arranged to be reeled in by specially-built electrical winches. In addition, there is a short fixed-wire receiving antenna attached to the hull of the airship. Duplicate motor generators are mounted just outside the radio room and supply high voltage current required for the radio outfit.

An eighteen-instrument telephone system is provided with a master switchboard located in the control car. Three conversations make take place simultaneously over this system, or the switchboard operator may call at least three outlying stations simultaneously, or he may sound all telephone alarms, using code if desired.

The control car or room is located near the forward part of the ship so as to obtain the best possible vision for operating purposes. The forward third of this control car is the location for rudder and elevator controls, gas and ballast controls, instruments and other apparatus which is essential to the functioning of the airship. The middle third of this control car is the navigating compartment, and the after portion of the control car is for access hatches and ladders. An emergency control station is located in the lower fin. Underneath the control car and the lower fin provision is made for detachable rattan bumpers. Above the control room are the radio and aerological rooms, quarters for the captain and a part of the officers; and also an office space and photographic laboratory.

Living 'accommodations are concentrated nearer amidships, abreast the airplane hangar compartment. On the port



Directionally adjustable propeller and one of the Maybach power units

side there is a crew's toilet and wash room and seven rooms, each having a floor area of about eight feet by ten feet, and each being fitted with four canvas-bottom bunks and locker spaces. On the starboard side, from aft forward, there are the generator room, galley, crew's mess, chief petty officers' mess, officers' mess, and two four-bunk rooms for officers. In order to save weight, it is customary in airships for more than one man to use in rotation the same bunk, and this will be done in the Akron. The normal flight crew of the Akron will probably be thirty-eight men and eleven officers, plus whatever personnel is required to operate airplanes. Along the corridor abreast the living spaces, cellon windows are arranged, but because of the contour of the hull in this region, these windows are nearly horizontal.

In the galley there is a propane gas stove and hot water heater, and these are supplemented by auxiliary electrical apparatus for serving coffee and night rations, making it unnecessary to light off the main gas-fired equipment except to prepare a full meal. The galley is fireproofed and is fitted with rather elaborate arrangements for taking care of garbage until it can be dumped overboard with safety. Provisions will be carried in conveniently arranged storerooms and some cold storage arrangements will be added.

For practically the first time in airship construction, effort has been made to provide heat for living spaces. Warm air, after passing over engine manifolds in the forward engine rooms, is led to a large insulated aluminum pipe which runs under the floors of the living spaces.

Seven gun emplacements have been located so as to cover all angles of approach and some of these emplacements will carry more than one gun. The final choice of guns, their arrangement, and means for ammunition stowage and supply are matters that must be worked out on the basis of actual experience, including joint maneuvers between airplanes and airships.

An observation basket which may be lowered several hundred feet below the airship is contemplated for future installation.

The Akron carries at her bow the conventional type of horizontal mooring spindle and pendant cone, the cone being dimensioned according to generally accepted international standards. lower fin of the Akron is made especially strong to serve as a point of support during certain ground handling maneuvers. Various attachment points are provided on the hull in the region of the stern and elsewhere to which handling lines for mechanical handling systems, or manually-controlled lines, may be attached. Inside the airship, working platforms, winches and trap doors near the bow provide the means for handling the 1/8-inch main mooring cable and the two 3/4-inch side or yaw cables used in mooring operations. In addition, there is a large door near the bow of the airship, which may be lowered to form a bridge connecting the airship with the upper platform of the mooring mast, thus providing a means of entrance and exit via the mast.

#### Characteristics of the USS Akron

| Characteristics of the ODS MATOR                                                |
|---------------------------------------------------------------------------------|
| Nominal gas volume (gas cells                                                   |
| 95% full)                                                                       |
| Length overall 795 ft                                                           |
| Length overall                                                                  |
| Width overall (propellers vertical) 137.5 ft.                                   |
| Height overall                                                                  |
| Normal spacing of main frames 74 ft.                                            |
| Number of gas cells 12                                                          |
| Weight empty or dead weight (es-                                                |
| timated)) (See Note 1) 221,000 lbs.                                             |
| Useful lift (estimated) (See Note 2) 182,000 lbs.                               |
| Total lift (based on nominal gas                                                |
| volume and helium lifting .062                                                  |
| lbs. per cu. ft.)                                                               |
| Ratio useful lift/total lift                                                    |
| Number of engines                                                               |
| Maximum speed (at 3,000 ft. alti-                                               |
| tude) (estimated) (84.0 m. p. h.) 72.8 knots                                    |
| Normal fuel capacity (approximate-                                              |
| ly 70% of useful lift) 124,000 lbs.                                             |
| Estimated Estimated Hourly                                                      |
| Speed Estimated Estimated Hourly<br>Still Air Range Fuel Consumption            |
| 72.8 kts. 4800 paut miles 1975 the                                              |
| 60 6600 naut. miles 1150                                                        |
| 50 9000 naut. miles 700                                                         |
| 60 6600 naut. miles 1150<br>50 9000 naut. miles 700<br>40 13000 naut. miles 380 |
|                                                                                 |

Men 77 Officers 12 (plus plane pilots) Normal flying crew Men 38 Officers 10 (plus plane pilots)

Note 1. Weight empty (subject to correction for probable overweight) includes the complete hull structure, power plant and accessories, outer cover, ballast installation, landing and handling equipment, instruments and miscellaneous items permanently affixed to the airship. Permanently affixed to the airship. Permanently affixed to the airship and the properties of the

## GERMAN TRANSPORT AIRPLANES

THE Focke-Wulf Aircraft Company of Bremen, Germany, though a relatively small enterprise, has in recent years produced a number of highly successful commercial planes, a large number of which are flying in the Luft Hansa service and in the service of smaller regional companies which favor them for short-distance work because of their relatively low cost and economical performance. The Focke-Wulf company also builds small planes of the sport type, but this branch of its production is of minor importance as compared with the manufacture of commercial planes.

Focke-Wulf planes have a reputation for exceptional stability in the air. This is generally accredited to the shape of the unbraced cantilever-type wing which, built in one piece, is secured to the top of the fuselage by steel flanges and bolts. The framework of the Focke-Wulf wing is constructed entirely of wood with a single four-flange box spar of pine with webs of plywood. The ribs and the nose moulding are also of this material. In some models the wing is entirely covered with plywood but, generally, part of the wing has fabric covering. The wing is of thick section, or high-lift type, with a very slightly back curved leading edge. The trailing edge has a more pronounced curve out to the rear with cut-outs being provided for the ailerons. The trailing edge is not a smooth, curved line, but in between the ribs the covering recedes slightly as in the earliest planes. The ailerons are attached at the tip sections generally in such a manner that their tips protrude beyond those of the main wing with their turning axes at an angle to each other. Their tip contours merge into those of the main wing tip. The ailerons and other control airfoils, with the exception of the stabilizer, are generally made of wood with fabric cover-The stabilizer has plywood covering. The upper surface line of the main wing is straight while the underside tapers up from the center of the wing tips, affording a slight lateral dihedral

The fuselage generally consists of a framework of welded steel tubing braced by steel tubing at the fore end and by cables and wires at the rear. The welded joints are reinforced by gusset plates. While the nose part of the

## (Part III) The Focke-Wulf Planes

Edwin P. A. Heinze

fuselage has a round section and aluminum covering, this form gradually merges into a rectangular section with rounded top towards the rear. The round nose section permits the use of N. A. C. A. cowling if desired.

With the exception of the "Canard" or "Ente" (Duck), all Focke-Wulf planes have a single engine and the fuselage, from the nose aft, is covered with fabric, the interior of the cabin being lined with plywood. The cockpit is located beneath the leading edge of the wing and is entirely enclosed.

The type called "Moewe" (Seagull) of



Focke-Wulf A-20 "Hawk"

the Focke-Wulf range of planes is the largest. Fifteen of these machines are operated in the service of the Luft Hansa. This ship is built in four models, A-17a, A-29, A-29a, and A-38, with slight modifications. All have the same wing span of 65.5 feet and wing area of 672.5 square feet. The center section of the wing has a chord of 12.14 feet. The wings are covered with plywood.

The Moewe planes are designed for the most economical transport of passengers over distances of from 450 to 750 miles, carrying enough fuel tor five hours' flight.

They are provided with comfortable searing accommodations for eight passengers and two pilots. The fuselage has a length of 42.5 feet and a height above ground of 13 feet. The cabin has a length of 11 feet six inches, a width of five feet and height of six feet. To the rear of the cabin is a lavatory and a luggage hold. Additional luggage space is provided in front of the pilots, between them and the fire wall with which all machines are turnished. A small mail bunker is provided underneath the cockpit with a hatch opening outwards.

As in all other Focke-Wulf planes, the fuselage is drawn down low to the ground to give easy access to the cabin, the entrance to which is at the rear end. An emergency exit is provided in the ceiling. The one-piece wing lies on top of the fuselage and is secured to it by means of steel channel fittings attached to a fuselage spar by steel bolts. Four hoisting fixtures are furnished on top of the wing above the fuselage connections.

The stabilizer is braced against the lower edges of the fuselage by steel tube struts. The elevator is divided and has fabric covering on a wooden frame. The stabilizer contours are practically semicircular as are those of the elevators. The rudder fin has a steel tube frame and a covering of fabric. It is fixed on top of the frame without lateral struts. The rudder is balanced.

The wheels, as in all other models, are individually sprung, their axles being hinged to the lower edge of the fuselage and braced by a pair of tension and compression struts to the fuselage and wing. Axles and struts consist of streamline section tubing. The rubber cord shock absorbers are located inside the wing nose. The tail skid is movable.

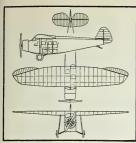
The Moewe A-17a is powered with a geared Gnome & Rhone or Siemens and Halske Jupiter engine (nine cylinder radial) developing 480 horsepower. The powerplant is supported in an annular frame of sheet steel secured by rivets and welding to the fuselage longitudinal and the steel tube diagonals. Thus, interchangeability of various types of motors is not provided, the makers preferring a firm fixture of the type described in preference to the standardized and interchangeable motor cradles favored by the BFW makers. The Moewe A-29 has a







Focke-Wulf A-29-a "Seaguil" used by the Luit mansa



Focke-Wulf A-33 "Sparrowhawk"

water-cooled twelve-cylinder BMW VI engine without reduction gear; the Moewe A-29a has the same engine but is provided with reduction gear of the Farman type. The geared engine delivers 650 horsepower as compared with the 600-horsepower output of the other. The radiator in these two planes is installed in front of the engine. The fuel. as in the other models, is stored in two tanks located in the wing from which it is gravity-fed to the Jupiter engine. In the planes with BMW engines, fuel is fed by means of AM pumps.

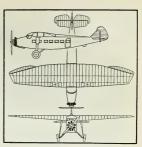
The Moewe A-17 has a weight empty of 5,380 pounds and a loading capacity of 3,411 pounds, the flying weight totaling 8,800 pounds with a wing loading of thirteen pounds per square foot and a power loading (Jupiter engine) of 18.5 pounds per horsepower. High speed is 124.5 miles per hour; cruising speed, 101 miles per hour; and landing speed, 66

miles per hour.

The gearless Moewe A-29 with the water-cooled BMW engine weighs 5,970 pounds but is, nevertheless, able to carry a load totaling 3,730 pounds so that the flying weight amounts to 9,700 pounds, giving a wing loading of 14.2 pounds per square foot and a power loading of 21.4 pounds per horsepower. High speed is 123 miles per hour and cruising speed is 106 miles per hour. The landing speed is 66 miles per hour.

The geared Moewe A-29a weighs empty 6,290 pounds and carries a load, including pilots and fuel, of 3,630 pounds. Fully loaded, this plane weighs 9,220 pounds, 220 pounds more than the gearless model, with a corresponding increase of the wing loading to 147 pounds per square foot. The maximum power output, however, being higher than fifty horse-power, the power loading is lower, amounting to 20.5 pounds per horsepower High speed is 130 miles per hour with the cruising speed at 112 miles per hour. The landing speed is 66 miles per hour.

The A-38 Moewe, which is the latest addition to the Focke-Wulf line, shows greater modifications than the other types as compared with the original Moewe plane. It retains the same wing but has a larger fuselage with a cabin measuring 4.9 feet in width, 5.6 feet in average height and 14.7 feet in length, accommodating ten passengers. In addition, there is room for a crew of three. Between the cockpit and the cabin is a cargo hold with a capacity of 88 cubic feet. Doors are provided to the cockpit, the cabin and to the outside. The rubber cord shock absorbers have been superseded by those of the compression ring type, and instead of a tail skid a low pressure Goodyear wheel, turnable within 180 degrees, is employed. The steering mechanism has been altered, a combined rod, bell crank and cable system being used. The landing wheels are provided with compressed air brakes. Exclusive of the stabilizer, which can be adjusted from the pilot's seat through a spindle device and which is made of wood, all steering surfaces have a steel tube frame, covered with fabric. The rudder and eleva-tor are balanced by overlapping. A new feature is the manner in which the engine is secured. Formerly it was fitted in a rigid support, welded and screwed to the fuselage frame; in this model the powerplant is hung up in articulated steel struts braced by cables giving a certain amount of flexibility. In former models the two fuel tanks, each holding 106 gallons, formed the nose of the wing. In A-38 Moewe the tanks are located inside but separate from the wing nose. A Siemens & Halske Jupiter engine developing 510 horsepower is used, but a BMW or the Siemens & Halske SH 20 is furnished if desired. Despite the relatively small power output, the machine has a maximum speed of 129 miles per hour, a cruising speed of 105 miles per hour and lands at 47 miles per hour. Weight empty is 5,950 pounds, The plane is capable of transporting a weight of 3,730 pounds, of which approximately 2,330 pounds comprise the payload. The full flying weight is 9,680 pounds. The wing loading is 14.4 pounds per square



Focke-Wulf A-38 "Seagull"

foot and the power loading, 19 pounds per horsepower.

The next in the line of Focke-Wulf machines are three "Habicht" (Hawk) models A-20, A-20a and A-28, of which the last mentioned is the latest. They are meant for passenger transport on short lines and accommodate four passengers and two pilots or, if a passenger sits beside the pilot, five passengers.

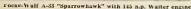
Each of the three models has a wing span of 52.5 feet and a wing area of 344.4 square feet with a chord of five feet three inches. The nose and spar is plywood-covered, the remainder is fabric-covered. The steering surfaces have a framework of wood, fabric-covered. Neither the stabilizer nor the rudder fin is supported by lateral struts.

The fuselage is entirely a wood and wire structure covered with fabric except at the end. The cabin is lined with plywood. The cockpit has aluminum lining. The length of the fuselage in all three models is 33.4 feet and the height, 9.8 feet. The cabin of the A-28, however, is one foot longer than those of the two other models.

The A-20 has a 120-horsepower water-cooled Mercedes engine with side radiators. High speed is 90 miles per hour; cruising speed, 80 miles per hour; and landing speed, 47 miles per hour. This plane weighs empty 2,180 pounds and has a loading capacity of 900 pounds. The flying weight thus amounts to 3,140 pounds with a wing loading of 9.1 pounds per square foot and a power loading as high as 26 pounds per horsepower.

This model, when built with an aircooled radial Wright engine of 200 horsepower, is called the Habicht A-20a,







Focke-Wulf A-35 'Seaguil"



The four-passenger Focke-Wulf A-28 with a 230 h.p. Bristol "Titan" air-cooled engine

which has a maximum speed of 106 miles per hour, a cruising speed of 94 miles per hour and landing speed of 50 miles per hour. The plane weighs 24 pounds more than the Mercedes-powered ship, but the load capacity is raised by 361 pounds to 1,321 pounds so that the full flying weight totals 3,525 pounds with a wing loading of 10.2 pounds per square foot and a power loading of 17.6 pounds per horsepower.

The A-28 model weighs 221 pounds more than the A-20a, but the load capacity is increased by the same amount, bringing it up to 1,542 pounds. The total flying weight is 3,970 pounds. The wing load is 11.5 pounds per square foot and the power loading is 17.2 pounds per horsepower. A 230-horsepower Trian engine is installed in this plane. High speed is 112 miles per hour; cruising speed, 100 miles per hour; and landing speed, 53 miles per hour.

The Focke-Wulf "Bussard" (Buzzard) A-32, has been developed from the Habicht type and is slightly larger, being able to carry seven persons in all. The cabin has room for five passengers and a sixth may be carried on the seat beside the pilot. The plane is designed principally for flights up to 360 miles.

The Bussard has an all-wood wing of \$2.5-foot span and an area of \$71 square feet. The fuselage is of welded steel tubing and is similar to that of the Moewe. Length is \$40 feet and height, \$10.6 feet. The ailerons are constructed of wood with fabric covering, as are the stabilizer and elevators. As in the other models, only the rudder is balanced. The stabilizer is braced against the fuselage. This plane is also supplied as a freight machine and for aerial photography. It is fitted with a water-cooled, six-cylinder, in-line Junkers L 5 developing 280-310 horsepower.

The Bussard has a weight empty of 3,230 pounds and is capable of taking a load of 1,840 pounds. Assuming the pilot and fuel together weigh 695 pounds, there remains a payload of 1,145 pounds. The flying weight fully loaded is 5,070 pounds, the wing loading being 13,6 pounds per square foot and the power loading, 16,7 pounds per horsepower. This plane has a maximum speed of 118



miles per hour. The cruising speed, however, is no higher than that of the Habicht, being 100 miles per hour. The landing speed is 50 miles per hour.

One of the latest Focke-Wulf planes is the A-33 "Sperber" (Sparrowhawk), which has room for four persons. It has been developed for the use of small regional air transpot companies requir-



ing a small plane especially suitable for taxi work. The general details of the design are similar to those of the other models. The wing has a span of 39.3 feet, an area of 237 square feet, a chord of seven feet. With the exception of the plywood covering of the nose and spar. the wing has fabric covering. The fuselage consists of a welded steel tube framework. The cabin has three stag-gered seats. There is room for a fourth seat beside the pilot. Contrary to the building methods adopted in the larger planes, the ailerons, elevators and rudder of the Sperber have a steel tube framework. The elevator has a wooden framework covered with plywood. The rudder is balanced. The fin and elevator are cross-braced and braced against the fuselage.

This plane is powered with a Czecho-Slovakian Walter "Mars" radial motor having nine cylinders and developing 145 horsepower. The Sperber has a weight empty of 1,477 pounds and will transport a total load of 992 pounds, of which 441 pounds may be allocated to the pilot and fuel, leaving a payload of 551 pounds. The full flying weight amounts to 2,469 pounds. The wing loading is 10.5 pounds per square foot and the power loading, 17 pounds per horsepower. The maximum speed is 102 miles per hour; the normal cruising speed, 90 miles per hour, and the landing speed, 51.5 miles per hour.

Finally, of Focke-Wulf planes, the 'Canard' (Duck) remains. This plane having been described at length in the January issue of Aero Digest, only the main features need be recalled here. The plane has two wings: one, a small one on top of the front end of the fuselage with a span of 16.4 feet and an area of 64.6 square feet; and the other, the main wing located further aft, with a span of 46 feet and an area of 317.5 square feet. Two engine nacelles each with 110-horsepower Siemens & Halske radial powerplants, are secured to the lower surface of the wing on each side of the fuselage. The Canard or "Ente" is by comparison with the other Focke-Wulf planes the least economical for it weighs empty, 2,585 pounds, takes a load of 1,045 pounds and requires 220 horsepower to bring it into the air and to convey it at the relatively low maxi-

(Continued on following page)



Focke-Wulf A-32 "Buzzard" with 280-310 h.p. Junkers L-5 engine

# "WITH ANY OTHER TYPE OF LANDING WHEEL

it would have been extremely dangerous"



THE following letter from Lieut. Winston W. Kratz, Aeronautical Corporation of America, tells such a vivid story of Airwheel safety that we let it speak for itself:

"While flying across the low swamp-lands of southern Alabama and Louisiana, the rain and fog had forced me to the very treetops and for fully half an hour, due to the fact that there was no possible landing space available, I was forced to fly with my wheels almost clipping the foliage.

"The situation became so bad that I determined to land at any spot that gave me a possibility of even cracking up safely.

"Finally a marsh appeared. It was so covered with water that the grass was barely discernible. I shot to note at about a 10 foot altitude and since it was all of equal wet-

ness I circled once more and with something like a prayer on my lips glided in for landing. To my great surprise, the ship did not nose over though it rolled not more than 20 feet upon landing and the tail was kept down only by holding the stick all the way back in my stomach and constantly blasting the motor.

"The following day the fog lifted somewhat, though the rain had not abated. I took out all possible weight, drained all but two gallons of gasoline, started the motor and, after warming it for several minutes, taxied with the aid of a couple of

road workers to a position at the far end of the marsh. I shoved the throttle forward but kept my stick well back. When I eased up on the stick, even as much as an inch, the tail would immediately lift and I knew that my only chance was to stall out. Finally the ship seemed to positively skip over the water and actually lifted out of that thick mud and water.

"There is no question but that with any other type of landing wheel such a take-off would not only have been totally impossible but it would have been extremely dangerous. I want to say that I am as thoroughly sold on Goodyear Airwheels as it is possible for anyone to be sold on any product, and I feel that I owe your company a vote of thanks for the service my airwheels rendered me on that occasion.

"While at Miami I had the pleasure of seeing your pilot, Mr. Hudson, and he told me the very interesting news that you now have brakes for wheels of the type which we are using. I am very anxious to get a set of these wheels with brakes as I would like to give them a thorough try-out. I frankly believe that our light ship equipped with braked-wheels will be able to do some rather marvelous things in its take-off.

"It was a pleasure to see you about two months ago at Akron and I hope that we will be able to get together in the near future."

Now that Goodyear Airwheels cost no more than other wheel and tire equipment, can you afford to fly without them? For full data, write to Goodyear, Akron, Ohio. or Los Angeles, California.

When you buy a new ship specify Goodyear Airwheels



EVERYTHING IN RUBBER FOR THE AIRPLANE

(Continued from preceding page)

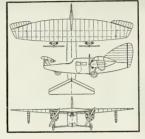
mum speed of 88.5 miles per hour. The full flying weight being 3,630 pounds, the wing load amounts to 11.45 pounds per square foot. The cruising speed is 79 miles per hour and the landing speed, 51.5 miles per hour. The sole advantage of this plane, which is doubtless open to further development and improvement of efficiency, is its safety qualities. It is practically impossible to stall the ship under any circumstances because the front plane is set at double the angle of incidence of the main plane; for this reason, the forward wing begins to stall before the main wing comes anywhere near the burbling point and the small plane, ceasing to lift in its stalled position, automatically drops, thereby preventing the main wing from reaching a stalled position.

The Focke-Wulf makers, by the way, claim that their other machines, especially those of the Habicht class, are proof against spinning because of the wing design. Indeed, no one has yet been successful in attempts to bring these machines into a spin, according to reports

of the company.

(Other German transport planes will be described by this author in forthcoming issues of Aero Digest.)

Focke-Wulf "Ente" monoplane



#### RECENT PATENTS

HE following patents of interest to readers of Aero Digest were issued recently from the United States Patent Office. Copies thereof may be obtained from R, E, Burnham, patent and trade-mark attorney 1343 H Street, N. W., Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

Aerial package carrier and signal. Paul P. Horni, Newark, N. J. (1,812,955.)

Helicoplane. Rudolph Luzardo, New York, N. Y. (1,812,968.)

Aeroplane. Arthur A. Root, Detroit, Mich. (1,813,201.)

Trolley plane. Frederick H. Mansfield, Houston, Tex. (1,813.245.)

Floating airport. James H. Todd, Brooklyn, N. Y., and George F. Wheeler, Riverside, Conn. (1,813,263.)

Tail-wheel support, Robert J. Minshall, Seattle, Wash., assignor to Boeing Airplane

Co., same place. (1,813,356.) Aircraft construction. Joseph B. Shain-

line, Norristown, Pa. (1,813,430.) Aircraft. Martin C. Snyder, Paterson, N.

J. (1,813,468.) Controlling means for aeroplanes. John F.

Cook, Jr., Detroit, Mich. (1,813,485.) Aeroplane. Edward H. Lanier, Covington, Ky. (1,813,627.)

Means for reducing eddy formations in the airflow passing aircraft bodies. Hubert C. H. Townend, Teddington, England, assignor to Boulton & Paul, Ltd., Norwich, Norfolk, England, (1.813,645.)

Aerial navigation. Frederick C. Bowman, Duluth, Minn. (1,813,694.)

Aircraft structure. Harold J. Pollard, Bristol, England, assignor to Bristol Aeroplane Co., Ltd., same place. (1,813,814.)

Flying machine. Vittorio Isacco, Paris, France, (1.813.852.)

Airplane propeller. Charles H. Gunn, San Francisco, Calif., assignor to Aircraft Specialties Co., San Mateo, Calif. (1,813,-

Take-off and landing apparatus for airplanes. Herbert J. Breeze, Chatsworth, Calif. (1.813,986,)

Aeroplane. Willard E. Blain, Van Buren, Ark. (1.814.115.)

Parachute construction. Andrew Johnson, Tacoma, Wash. (1,814,220.)

Safety device for aeroplanes. Leon M. Miyasaki, Los Angeles, Calif. (1,814,325.) Airplane construction and method therefor. John B. Jewett, Jr., Newtown, Ohio. (1,814,556.)

Propeller. Ferdinand A. Gill, Chicago,

III. (1,814,595.) Aircraft signaling apparatus. Manuel

Castro, Canton, Ohio. (1,814,786.) Safety airplane. Margaret Cheetman,

Youngstown, Ohio. (1,814,829.) Aeroplane. Gust Pappadakes, Bronx, N. Y. (1,814,846.)

Airship. Joseph J. Hicks, Los Angeles, Calif. (1,814.848.)

Aerial navigation machine, Charles R. Miner, San Francisco, Calif., assignor to American Airship Corporation, Wilmington, Del. (1,814,948.)

Aircraft. Charles H. Ohlrich, Philadelphia, Pa. (1,814,957.)

Aircraft landing apparatus. Pablo V. Florido, U. S. Navy. (1,814,985.)

Method and device for the automatic starting of aeroplanes. Raoul Bernady, Istres, France. (1.815,092.)

Cabin for air and water craft. Samuel E. Hitt, Elyria, Ohio. (1,815,103.)

Airplane construction. James E. Sperry. Gresham, Neb. (1,815,124.)

Synchronous running-gear for airplanes. Joseph Blondin, Los Angeles, Calif. (1,815,-

Propeller. Thomas A. Dicks, Pittsburgh, Pa., assignor to Pittsburgh Screw & Bolt Corporation, same place. (1,815,191.)

Propeller, Thomas A. Dicks, Pittsburgh, Pa., assignor to Pittsburgh Screw & Bolt Corporation, same place. (1,815,192.)

Device for assisting in the launching and landing of aeroplanes. Rudolf Hamburger, New York, N. Y. (1,815,200.)

Dirigible flying machine. Joseph B. Strauss, Chicago, Ill. (1,815,338.)

Aeroplane machine, Basil Zaharoff, Jamaica, N. Y. (1,815,341.) Aeroplane parachute, Joseph Chab, Dor-

chester, Neb. (1,815,430.) Mail-carrying aeroplane. Roy Fisher, Los

Angeles, Calif. (1,815,466.) Airfoil lift control, John R. & Gerhard

H. Albers, Cherokee, Iowa. (1,815,489.) Aeroplane, Carl Stickley and Raymond L. Robinson, Davenport, Iowa. (1,815,597.) Aircraft. Francis A. Bowling, Gettys-

#### NEW PROPELLER

burg, Pa. (1.815,758.)

A NEW airplane propeller which, its inventors believe, will more than double present airplane speeds and reduce noises, has completed its wind tunnel tests at New York University and will shortly be introduced to the airplane market. The propeller, the invention of the Portuguese, Carlos Gallo, is of radical design and appearance. It will be manufactured in this country by the Gallo Airplane Propeller Company, New York City.

Viewed from the front, the propeller presents the appearance of an enlarged cone, the base of which is about the same size as the diameter of the plane's engine. The blades are short and stubby and extend at a sharp angle from this conical surface. Their width coincides with the length of the hub. The efficiency of the new prop is claimed by the inventors to be greater than that of conventional props at ordinary speeds. Its chief effectiveness lies in the fact that this efficiency is maintained at speeds two to three times as great as that heretofore practical for the ordinary engine, according to sponsors. The decrease in diameter decreases by three times the linear distance through which the propeller tips travel, with a consequent lessening in the noise created. The greater width of the propeller base compensates for the decrease in length, creating a blade area approximately eight times as great as that of the conventional blade.

Flight tests are scheduled at an early date at Jamaica Sea Airport, Long Island, New York.



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THE TEXAS COMPANY, 135 East 42nd Street, New York City



## DIGEST OF FOREIGN TECHNICAL ARTICLES

#### TELEVISION FOR AIRPLANES

The Transmission of Images Between an Airplane and the Ground (Note sulla trasmissione delle immagni dagli aerei alla terra e viceversa, U. Guerra. L'Aerotecnica, Vol. II, No. 5, May, 1921, pp. 533-556, 8 figs.

THE advantages of a television connection between airplanes and the ground, for both military and commercial purposes, are discussed and the basic elements necessary to establish a reliable television connection for aeronautical use are explained. The methods of synchronization best adapted for television communication are shown with reference to two special methods which are thought to offer remarkable advantages in regard to resistance, efficiency and economy in weight and volume.

The most suitable velocity and duration of transmission for aeronautical use are taken up and the influence of atmospheric and other disturbances on communication are considered. The requirements of apparatus for airplanes are reviewed and a device is described in which the isochronism between transmitter and receiver is eliminated. The necessary ranges are dealt with and the possibility of using short waves in long-range communication for television is suggested.

#### AERODYNAMICS

Measurements of Downwash Behind a Wing in an Interrupted Flow of Air (Abwindmessungen hinter Tragftigeln mit abgerissener Strömung). E. Petersohn. Zeitschrift für Flugtechnik und Motorluftschiffahrt, Vol. 22, No. 10, May 28, 1931, pp. 289-300, 32 figs.

I N an interrupted flow of air, the varia-tions in velocity behind the wings of airplanes are very large, and are of great importance in judging the stability of the airplane. In order to secure data on the velocity ratio back of the wing, an investigation was undertaken at the Aerodynamic Research Laboratories at Goettingen. The experiments described were carried out in a small 1.2-meter diameter wind tunnel. For different angles of attack from 0 to 60 degrees, the static and total pressures were measured behind the wings along different perpendiculars (at right angles to the direction of the unobstructed wind and to the span of the wing). Wing polars are shown for the usual three-component measurements.

It was found that behind the wing after the burbling point there occurred a powerfully impressed wind shield, that is, a decrease in the total and velocity pressures. The location of these wind shields deviated very slightly from the direction of the unobstructed wind, and the shields seemed to be quite independent of the size or direction of the contour of the wing.

Flow of Air Adjacent to the Surface of a Rotating Cylinder, E. G. Richardson. (British) Aeronautica Research Committee-Reports and Memoranda No. 1388 (Ac. 495), December, 1930, 12 pp., 18 figs.

THE report discusses measurements of the average velocity and the amplitude of velocity fluctuation close to the surface of a rotating cylinder in a stream in twodimensional flow, these being made at various ratios of stream to peripheral velocity.

#### Elsa Gardner

The results shown are in agreement with the classical theory of the Magnus effect outside the boundary layer, provided a circulation equal to about two-thirds of the theoretical value is assumed.

These results are coördinated with measurements of lift and drag of the rotating cylinder on a force balance. The variation of skin friction around the surface is compared with the variation of the power required to rotate the cylinder. The general results are in agreement with a modified form of the circulation hypothesis, having regard to the steep gradient of velocity in the boundary layer around the cylinder.

The Drag of Circular Cylinders and Spheres at High Values of Reynolds Number, A. Page. (British) Aeronautical Research Committee-Reports and Memoranda No. 1370 (Ac. 497), May. 1838, 6 pp., 2 figs.

R ESULTS of experiments made recently to measure the drag of a circular cylinder of large diameter (3 in.) are discussed. The more important measurements of the drag of circular cylinders and spheres at high values of Reynolds number, which were obtained in England and other countries, are also included.

An analysis of these measurements leads to the conclusion that the flow in an open-jet tunnel of the Goettingen type, with a contracting mouth and with the honeycomb at the larger end, is steadier than in a National Physical Laboratory type of tunnel. The drag coefficients of a circular cylinder and of a sphere appear to be slowly increasing at the highest values of Reynolds number attained.

#### WHEEL BRAKES

Tests of Airplane Brakes (Versuche mit Flugzeugbremsen), F. Michael, Zeitschift für Flugtechnik und Motorluttschiffahrt, Vol. 22, Nos. 10 and 11, May 28 and June 15, 1931, pp. 302-312 and 338-344, 40 figs., 5 tables.

THE special object of the experiments described was to show the designer of airplane brakes the special conditions under which the brakes have to operate in airplanes and the effect of brakes as a new element in the design and properties of airplanes. After a discussion of the practicability, advantages, and disadvantages of different brake designs, the servo-operation of the inner brake shoe is considered in detail.

Measurements were made to determine the influence of landing-wheel brakes with different forms of tail skid and the decrease in taxying attainable, the retardation of the airplane and swaying during taxying, the brake mounted and the influence of the surface of the ground upon the possible operation of the brake, and finally the action with different brake linings under the various operating conditions.

The author points out the difficulties in designing brakes for the popular type of airplane wheel which uses very low air pressure in the rims and requires very much smaller wheel body, thus limiting the available surface for brakes and the conduction of heat.

Report of the Deutschen Versuchsanstalt

#### SEAPLANE FLOATS

Floats and Float Tests (Uber Schwimmer und Schwimmerversuche), F. Seewald. Zeitscrift für Flugtechnik und Motorluftschiffahrt, Vol. 22, No. 9, May 15, 1931, pp. 265-276, 10 figs.

UESTIONS regarding the drag of seaplane floats and the impact in takeoff and landing in the sea are answered and the results of work undertaken by the Deutschen Versuchsantalt für Luftfahrt are discussed. Determining the drag of floats in taffe-offs by means of model tests is described. The dependence of drag upon the trimming angle, that is the moment about the lateral axis, is shown and a general opinion is expressed regarding the effect of the attitude of the plane upon the drag and moment.

Deductions for the design of seaplanes and model tests are given and the possibility of making float tests available for all types is taken up. The impact produced by a thick float is determined. The influence of elasticity, keeling, and the sea upon the impact is discussed and measurements of the percussion force made in the sea are given.

#### AIRPLANE BRAKES

Aeroplane Braking Systems, R. Waring-Brown. Aircraft Engineering, Vol. 3, Nos. 28 and 29, June and July, 1931, pp. 139-140 and 157-161, 30 figs.

A COMPREHENSIVE survey of the problem of fitting wheel brakes and the types in use at present is given by the Technical Sales Manager of the Bendix-Perrot Brake company. After taking up the subjects of position of wheels, design of undercarriages, transmission of brake torque, head resistance, various methods of brake control, the author determines the formulas for calculating brake diameters and gives values for different wheel sizes and aircraft weights as produced by leading manufacturers. He also deals with the design of wheels and tires and covers internal friction, independent wheel operation, and pneumatic brakes.

#### STRUT PROFILES

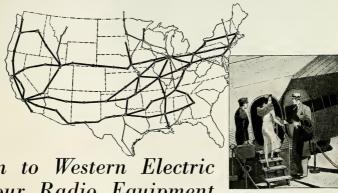
Contribution to the Theory and Testing of Strut Profiles (Prispevek K Teorii Zkouskám Vzperovych Profilu), V. Smolar. Zprávy Vojenského Lateckho Ustavu Studijního V praze, (Report of Military Institute of Aeronautical Researth at Prague), Vol. 5, No. 16, 1931, pp. 1-37, 28 figs., 6 tables. Written in Czechoslovakian with abstract in French.

THE author selects the method of transformation to conform to an ellipse in theoretically determining profiles for struts, stating that this method has the advantage of rendering possible a solution of dissymetrical flow, a problem which cannot be solved by the Rankins method. Flow around an empirical U. S. A. Navy No. 2 strut was found. The object of the tests described was to verify experimentally for these profiles the principles of the calculation of the aero-dynamic resistance due to the work of frictions.

(Continued on following page)



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(Continued from preceding page)

tion of the air determined for theoretical speeds over the profiles. The tests were carried out in the wind tunnel of the Military Institute of Aeronautical Research at Prague, on various models with the same profile but differing in size and material, in order to obtain a large range of Reynolds numbers and the effect of friction on the surface. Results are compared with those obtained by the N. A. C. A. on the same profile.

It was proved that the drag coefficient of the empirical profile calculated from the work of friction of the air on the surface (at the boundary layer) of the strut is in accord with the average coefficient determined by the tests. The results showed the practical value of the profiles employed. Tests of models of the same form in plaster and in wood proved the practical agreement of the two methods of making models from the point of view of surface friction.

## EUROPEAN NIGHT AIR MAIL Night Air Mail, C. Florman. Royal Aeronautical Society Journal, Vol. 38, No. 246, June, 1931, pp. 460-480 and (discussion) pp. 481-488, 8 figs.

PRESENT night air mail traffic in Europe and its organization are discussed by the Managing Director of the A. B. Aerotransport, Stockholm, and compared with night air mail service in the United States. In regard to the future, the problem of establishing and enlarging a night air mail system which, with smallest number of miles flown, gives the best economic and practical results, is considered. The author gives his opinions in regard to the best type of instruments for blind flying, lighting arrangements for night landing, intermediate landing grounds, the design, construction, and location of beacons, crew, wireless, meteorological service, and the most suitable type of airplane for reliable night service.

#### LONGITUDINAL STABILITY

Quantitative Measurements of the Longitudinal Control and Stability of the Bristol Fighter When Stalled, with Reference to Stalled Landings, E. T. Jones and R. P. Alston. (British) Aeronautical Research Committee—Reports and Memoranda No. 1367 (Ac. 434), September, 1939, 8 pp., 13 figs.

THE degree of longtudinal control and stability at high incidence was found for a Bristol Fighter airplane in the described tests, which were made to obtain data relevant to landing from stalled glides. A unique trimming curve was secured for a definite center of gravity position up to the highest incidence that could be maintained and there was no evidence of failure of the ellevator control.

It was concluded that the power of the longitudinal control up to the highest incidence was adequate to neutralize the maximum rate of pitch obtained during bumpy atmospheric conditions. Small incidence changes beyond stalling incidence could be effected fairly quickly, but to change from a fully stalled to a slightly unstalled glide (24 to 16.5 degrees) took about 30 seconds, and the aircraft lost about 500 feet before the motion became steady at the new incidence.

It was suggested that a visual angle indicator graduated in feet per second would enable a pilot to fly steadily in the stalled state at a desired rate of descent. A good degree of longitudinal stability was shown at all incidences beyond the peak of the lift curve. It was found that stalled glides could be made right down to the ground in fairly calm atmospheric conditions and that a safe landing could be made provided the undercarriage and tail skid were sufficiently robust to withstand a vertical velocitity of 10 per cent above the mean fully stalled rate of descent.

#### GASOLINE-ALCOHOL FUELS

Adaptation of a Gasoline-Alcohol Fuel to a Lorrain-Diertich 450-hp. Engine (Badmin and assotanta-Diertich 450 KM), F. Peter, S. Olssewski, J. Dzewonski, and H. Krasinski. (Institute of Acronautical Kesserich at Warssey) Instyute Badan 35-74, 14 figs., 9 tables. Written in Polish and French.

THE experiment described were undertaken by the Institute of Aeronautical Research at Warsaw to find an airplaneengine fuel which may be produced in large quantities in Poland. Laboratory tests on liquid fuels, especially with regard to detonation, were carried out on a special E-35 engine of H. R. Ricardo's with a variable compression ratio, being coupled to an electric dynamometer. Tests were also made on a 450-hp. Lorraine-Dietrich engine (this being the type most commonly employed in Poland) both on a Heenan-Froude test bed and on an airplane during flight. Tests were conducted on the dilution of lubricating oil by alcoholized fuels and their physical and chemical properties.

It was found that the addition of alcohol to fuel aided the operation of the engine. reducing the temperature of combustion and smoothing out the explosion. The results of the experiments appear to confirm the supposition that the life of the engine will be extended by the use of an alcoholized fuel. Without certain mechanical modifications such as increasing the compression ratio and assuring a better preheating of the carburetor, or without regulating the carburetor to increase the fuel consumption, it was not considered prudent to add more than 15 per cent alcohol to the fuel for the Lorraine-Dietrich engine. This 85/15 fuel mixture was employed in aviation with advantage to the engines; its use did not require any mechanical modifications or regulation, and the range of the airplane using it remained the same. At short notice, the Polish airway, Lot, started employing this fuel mixture early in 1931.

#### SCHNEIDER TROPHY ENGINE

A 1929 Schneider Trophy Engine—The 1600-Hp. Hissano-Suiza (Un moteur de Coupe Schneider 1929: le 1600 Hp Hispano-Suiza). L'Aéronautique, Vol. 13, No. 146, July, 1931, pp. 238-241, 15 figs.

CONSTRUCTION details of the 1929 racing engine, Model 18R, which was made by the Hispano-Suiza company are given and compared with those of the 18 Sb and 18 Sbr 1000-hp. engines. No facts are given, however, concerning the construction of the new model for the 1931 Schneider Trophy Contest.

There are four crankcases of Elektron, one upper, one lower and one in the front and in the rear. The cylinders are arranged in V's with 80-degree angles between. A forced circulation of air is provided in the body around the bearing, which allows a reduction of the required bearing area and a decrease in the length of the engine. Arrangements for a Farman reduction gear in the front-trankcase on Bernard and Nieuport seaplanes are shown. The one-piece crankshaft has seven bearings. The bore and stroke are, respectively, 150 and 170 millimeters. The Model 18R has a compression ratio of 10, due to the special form of piston employed, while the 18 Sb has a compression ratio of 60, ratio of 70 for millimeters.

#### DETONATION

Detonation, Mineral Lubricating Oils and Blended Fuels, R. O. King and R. Moss. (British) Aeronautical Research Committee-Reports and Memoranda No. 1362 (E. 44), July, 1930, 11 pp., 8 figs.

THE experiments reported are a continu-ation of previous tests described in Reports and Memoranda No. 1318 which showed that the high anti-knock value given to fuels by the addition of benzole or metallic dope was generally diminished when lubricating oil was distributed throughout the fuel-air mixture during combustion. The present experimental work was undertaken to ascertain the effect on detonation of typical basic varieties of mineral oils and to investigate the difference in oil effect on plain and doped fuels. The fuels used were aviation gasoline plus benzol or lead dope. and a series of blends made up with varying proportions of paraffins, naphthenes, and aromatics. Numerous combinations of oils and fuels were tested with induction temperatures from normal to 90 degrees Centi-

#### AERODYNAMICS

Research on an Airplane with Variable Wing Area (Untersuchungen über Flugzeuge mit veränderlich Flächen), W. Schmeidler. Zeitschrift für Flugtechnik und Motorluftschiffahrt, Vol 22, No. 11, June 13, 19°t, pp. 325-329, 31

R ESEARCH undertaken at the Breslau Technical High School on an airplane designed by the author is described. The plane was constructed with a section in the upper wing which could be pushed back, increasing the wing surface, raising the camber, and varying the profile in a direction which is advantageous for take-off and landing. The research was carried out on the lift distribution over the width of the wing area and could not be made according to any known rules.

The results of flight tests are compared with those of the wind tunnel experiments. It was found that besides the usual horizontal vortex bands back of the trailing edge of the wing, two vertical vortex bands arose.

#### AIPLANE FUELS

The Question of Fuel Quality, F. R. Banks. Aircraft Engineering, Vol. 3, No. 29, July, 1931. pp. 168-170, 3 figs.

In this survey of the fuel problem, the Technical Representatives in Europe for the Ethyl Export Corporation pleads for fuel to be treated as a "material" with as rigid specifications as construction materials and suggests that the engine should be designed for the fuel. He deals exhaustively with the use of tetraethyl lead in gasoline.

## A SURE CURE FOR PRE-IGNITION, OR SOOTING OF SPARK PLUGS

The AC heat range system puts in your hands a simple, scientific basis for correcting spark plug troubles. It shows you how to select the most efficient spark plug for every type of service-plugs that will not soot or foul when you make short hops or fly at half throttle much of the time, or that will not cause pre-ignition when you make long flights at full throttle.

This system for fitting spark plugs to individual flying requirements employs AC Miko spark plugs in seven gradations of insulator length. When you find indications that a plug has been running too hot, you merely change to a plug with shorter insulation exposed to the combustion temperature. Likewise, you choose a plug with more exposed insulation when your plugs have not been running hot enough to keep themselves clean. The method is simple, the results are certain.

Ask your AC representative or jobber's salesman, or write direct to the factory, for the new AC heat range specification charts, covering all aircraft engines.

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## THE SIKORSKY S-40 AMPHIBION

THE new Sikorsky S-40, the largest airplane ever built in America and the largest amphibion in the world, was first test flown on Long Island Sound at Bridgeport, Conn., August 7. Since then the big amphibion has been undergoing a series of rigid tests on land, water and in the air. Its performance has been pronounced satisfactory and Igor Sikorsky, the designer, on the basis of his achievements in this ship, declares that he can build flying boats twice as large—up to 75,000 pounds or more—and make them fly successfully.

The size of the S-40 is impressive. It can carry 45 people and a ton of mail and baggage; it is 24 feet high, has a wing span of 114 feet and an overall length of 76 feet, eight inches; its gross weight is 34,000 pounds, or 17 tons.

This huge structure of steel and duralumin can take off in 20 seconds and fly at 130 miles per hour or better. Four Pratt & Whitney Hornet engines give it 2,300 horsepower, more power than the average railway locomotive. It has a fuel load capacity of 6,830 pounds, which alone is more than the weight of some trimptor transports now in service.

The interior of the cabin is built like a Pullman car. It is 18 inches wider than a Pullman, with compartments, wide aisles, eight-foot ceilings and large windows which give an unobstructed view of the ground. There are three chair compartments, a buffet, smoking room, ladies lounge, baggage and mail compartments and crew's quarters. The ship is large enough to afford most of the travel comforts available on land and water.

A crew of five men—a pilot, co-pilot, engineer, radio operator and steward—will be carried. The number of passengers that can be accommodated will depend on the route. With a full fuel load, the range is about 1.000 miles.

The S-40 is the first of two planes built to order for the Pan-American Airways. The second is under construction at the Bridgeport plant of the Sikorsky

Aviation Corporation and is more than half completed.

About three years ago the Pan-American company, which operates international airlines connecting North and South America, saw that it would require improved equipment to meet future expansion. One of the most important links in the Pan-American chain is the direct over-water line from Miami to Panama, a route of 1,350 miles with a halfway stop at Jamaica.

Aircraft manufacturers were invited to submit designs for a ship that would be large enough and seaworthy enough to operate over what is practically an ocean route. The Sikorsky design, a development of the well-known S-38 type amphibion, was approved. Engineers of the airway company, including Col. Charles A. Lindbergh, its technical adviser, conferred with Mr. Sikorsky and the S-40 was conceived on paper in 1928 in virtually the same form as it exists today.

There were, however, a number of details to be worked out and problems presearch could resolve. In the first place, the S-40, while a lineal descendant, is not the immediate offspring of the S-38. It is rather the latter's great-grandchild. The intermediate predecessors of the S-40 existed only in theory, but they had to be designed, modeled, calculated and tested with as much care as if they actually were to be built.

This made double work for the engineering staff. Drawings and blueprints, wind tunnel work, boat models and pontoons of planes that were never built and that were never intended to be built, bridged the gap between an eight-ton ship and a 17-ton ship. Actual construction of the S-40 did not begin until December, 1929.

One of the most delicate problems was the arrangement of the engines in relation to the wing and boat—whether they should be in tandem or abreast (as they are), or above or below the wing, Models were made and tested in the wind tunnel for air resistance. More than 300 hours were spent in wind tunnel tests. In April, 1929, Mr. Sikorsky made the first water tests with models of the hull, using the basin at the Washington Navy Yard and later the Housatonic River at Stratford, Conn.

A boom was rigged to a speed boat and models six feet long were towed over the surface of the Housatonic at 30 miles an hour. Instruments recorded their performance. The present hull of the \$-40 is a compromise combining the best air and water qualities of a score of models. Tests made last month in comparatively rough water on the Sound showed the finished hull to be as steady as a steam yacht, Mr. Sikorsky said. It has a displacement of 219,500 pounds and a draft of about three feet. It can land safely in six to eight feet of water. The landing speed in early tests was 60 miles per hour, about five miles per hour better than the designer's estimate.

The retractable landing wheels presented another problem. They are much the largest wheels of this type ever constructed. The tires were made to order and are 58 inches high by 14 inches in diameter. Mr. Sikorsky believes the S-40 approaches the maximum limit in amphibion gear and doubts whether larger amphibions will be built. It is Mr. Sikorsky's opinion that larger ships will be operated entirely on water.

The landing gear weighs 1,700 pounds and is designed to withstand a total load of 153,000 pounds. Theoretical maximum load of the ship is 58,000 pounds. Either one of the wheels, therefore, is strong enough to support more than the maximum total weight.

One mile of wire, for controls, electric current, radio, and 338,666 rivets were used in the plane. There were 18,600 separate parts in the wing, a standard Sikorsky type of metal ribs with fabric covering. The weight of each alleron is 53 pounds. Under static tests they withstood a pressure of 945 pounds, or 15 pounds to the square foot, without



The Sikorsky S-40 contrasted with the single-engined amphibion

strain. That is about six times the pressure they will sustain under the most violent flight conditions.

Pan-American Airways will use the ship as a flying boat rather than an amphibion after it is put into regular scheduled operation. The landing gear will be carried, however, as an additional safety factor, since about 50 miles of the Miami-Panama route is over the

island of Suba.

The interior decoration and furnishings of the S-40 are being complete. Upholstery is blue and orange and the drapes are of heavy rope and gray silk. The walls are finished with walnut panels. Five hundred square feet of sound-proofing material, half an inch thick, sheathes the cabin and reduces noise to a minimum. Even without sound proofing the ship is comparatively quiet, as the motor nacelles are above and well removed from the hull.

Many small conveniences, such as reading lights, ash trays, cigarette lighters, writing tables, chess, checker and backgammon boards, card tables, check to have been provided in the S-40. The steward's pantry aft contains an electric stove and refrigerator; hot meals and cold drinks can be served in flight. A call system with a button at each chair connects with the pantry. In the stopping will be emergency



The Sikorsky S-40 amphibion taxying on the water

plane, if necessary, can exist on the sea for an indefinite period inasmuch as six life-saving rafts, equipped with emergency rations, will be carried.

From the exterior the ship can be easily identified because of its size and unique Sikorsky outrigger design. It will be finished in silver with navy blue struts, silver wing and tail, and yellow stripe on the top surface of the wing.

#### Specifications

| Overall length                               |
|----------------------------------------------|
| Overall height, on wheels 23 feet, 10 inches |
| Overall span114 feet                         |
| Wing chord192 inches                         |
| Wing area, including struts1875 sq. feet     |
| Dihedral                                     |
| Incidence                                    |
| and the conty. fully equipped 21,500 lbs.    |
|                                              |

| Weight per square foot18.2 pounds           |
|---------------------------------------------|
| Weight per horsepower14.8 pounds            |
| Gasoline capacity, wing tanks540 gallons    |
| Gasoline capacity, float tanks500 gallons   |
| Total gas capacity                          |
| Wheel tread                                 |
| Length of hull                              |
| Beam of hull                                |
| Height of propellers above water line 7 ft. |
| Propeller diameter 10 feet, 6 inches        |
|                                             |

#### Dorformana

| Feriormance                                |
|--------------------------------------------|
| Range with 24 passengers935 miles          |
| Range with 40 passengers500 miles          |
| High speed at 1950 r.p.m                   |
| High Speed on 3 engines110 m.p.h.          |
| Cruising speed at 1700 r.p.m110-115 m.p.h. |
| Initial climb, per minute712 feet          |
| Landing speed65 miles per hour             |
| Ceiling                                    |
| Ceiling on 3 engines6,600 feet             |
| Take-off, land, full load20 seconds        |
| Take-off, water, full load25 seconds       |
|                                            |

## NEW FILTER FOR GASOLINE

The Army Air Corps has developed a gasoline-purifying device which removes the water content in gasoline in a simple manner, obviating the tedious practice of straining the fuel through chamois skin.

\*The device, which was invented by Master Sergeant David Samiran, has been thoroughly tested and has been pronounced satisfactory.

The operating principle of the invention takes advantage of the natural tendency of water and gasoline to separate, due to difference in specific gravity. This separation is facilitated by the special design of the interior of the fluid chamber which directs the liquid flow so that the water is delivered to the bottom with a minimum of turbulence. while the gasoline is drawn off through an outlet at the top after passing through an efficient sediment screen. The accumulated water is discharged automatically by the operation of a simple float valve mechanism operating on the principle of "differential buoyancy." Only one moving part is employed. The resulting simplicity permits interchangeability of many parts of the various models. The size of the segregator required for any specific purpose is determined from the volume and rate of liquid flow called for.

Models have been produced for installation on gasoline delivery tank-trucks, in storage systems and fuel systems of airgraft.

#### APPROVED TYPE COMMERCIAL AIRPLANES NOW IN PRODUCTION

S pecifications: Span, upper wing, 25 feet 10 inches; lower wing, 25 feet 10 inches; lower wing, 25 feet 10 inches. Height overall, 19 feet 2 inches. Height overall, 7 feet 5 inches. Wing area (including ailerons), 178 square feet, (Models A2-60 and A2-100, respectively.) LeBlond 65 horsepower; Kimner K-5 of 100 horsepower. Weights empty, 810; 1,002 pounds. Useful



#### ARROW

#### SPORT A2-60 AND A2-100

Arrow Aircraft and Motors Corporation Lincoln, Nebraska

loads, 300; 480 pounds. Gross weights, 1,270; 1,650 pounds.

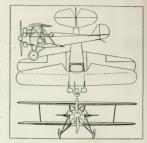
1,270; 1,650 pounds.
Performance: High speeds, 95; 105 miles per hour. Cruising speeds, 75; 90 miles per hour. Landing speeds, 25-30; 42 miles per hour. Climb, first minute, 800; 1,100 feet. Service ceilings, 14,000 feet; 16,000. Gasoline capacities, 16; 22 gallons. Model A2-100 climbs to 8,500 feet in 10 minutes and has a radius of 3.5 hours. (Figures for Model A2-60 obtained in flight test at Havelock, Neb., with full load.)

Neb., with tull load.)

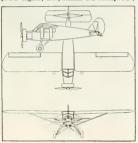
The fuselage framework is constructed of seamless steel tubing, U. S. A., True Warren truss system is used. The wings are full cantilever with a framework constructed of box spars with spruce flanges and spacer blocks, two-ply diagonal mahogany webbing. The ribs are spruce throughout with three-ply mahogany gusset plates. Drag wires are 14 gauge hard steel. Fittings are 1025 steel. The framework of the ailerons and tail surfaces is constructed of seamless steel tubing.

The landing gear is of the split-axle type with chrome-molybdenum framework, and is equipped with rubber shock cords, Hayes wire wheels, Firestone or Goodyear tires and tubes. As standard equipment a Hartzell wood propeller is supplied.

Seating arrangement is side by side for two passengers.



Specifications: Models 15C, 15N, and 15D, respectively. Spans, 43 feet 3 inches. Lengths overall, 27 feet 6 inches. Heights overall, 81 feet 10 inches. Wing areas (including ail-grous), 280 square feet. Power loading, 16.7; 15.2; 13.3 pounds per horsepower. 15C powered with Challenger 185 horsepower engine; 15N, Kinner 210-horsepower power engine; 15N, Kinner 210-horsepower.



Specifications: Span of wing, 26 feet. Rotor diameter, 41 feet. Length overall, (not including rotors), 19 feet 9 inches. Height overall, 12 feet 3 inches. Wing chord, 54 inches. Rotor chord, (outer), 23 inches; (inner), 13 inches. Span of clevator plane, 13 feet 10 inches. Tread of wheels, 12 feet. Diameter of propeller,



#### CURTISS-WRIGHT

SEDAN

Curtiss-Wright Airplane Co. Wichita, Kansas

15D, Whirlwind 240-horsepower, Weight empty, 1,975; 1,965; 1,195 reloads, 1,138; 1,238; 1,110

miles per 1 48 miles 700: 750 11,200; ties, 60 The tubing from The so c in a The tab

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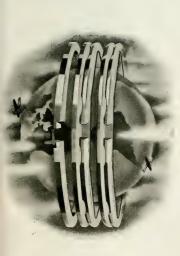
weights, 2,750 Performa

landing gear is vee type. Aircraft Products wheels and brakes and Travel Air Hydro-Flex shock absorbers are used. An electric starter, metal propeller, Townend Rings and wheel pants are provided. The Sedan ac-commodates two pilots and two passengers and 117 pounds of baggage. Controls are dual if desired.



211 tir el.

Boardman and Polando, flying from New York to Istanbul with a Wright Whirlwind engine.. 5040 miles in 49<sup>1/2</sup> hours..set world's distance nonstop record..another record flight made with U.S. Aviation Brand Piston Rings.



We have successfully solved the piston ring problems of many aviation engine builders and can supply a suitable ring to meet any condition or requirement.

#### Business is Good!

We have shipped more *U. S. Aviation Brand Piston Rings* to all the prominent aviation engine builders in 1931 than during any other similar period in aviation history.

They are guaranteed to give positive results

A FTER ploughing through fog at sea—soaring over snow-capped mountains—their Wright-powered Bellanca hit Istanbul right on the nose. This, as do all famous flights, centers attention on engineering details. The Wright "Whirlwind" in Lindbergh's "Spirit of St. Louis" was equipped with U. S. Aviation Brand Piston Rings. His present plane is powered with a Wright "Cyclone" that also has the same dependable rings. The Wright-powered planes of Commander Byrd on his North and South Pole explorations were likewise equipped with these remarkable long-life rings. These rings assure complete and continued sealing with the least amount of attention. The engineering endorsement of tamous builders of famous engines is behind the selection of U. S. Aviation Brand Piston Rings for any internal combustion engine.

**Demand** U. S. Aviation Brand Piston Rings—for the extra long life that is built into them. Demand them for their precision, true circle, perfect flatness, uniform wall thickness and other features that are not found in any other piston ring.

Practically any ring of recent manufacture may be expected to stand up for a reasonably long flight, but then most of them will be entirely spent at the goal. There is a vast margin of safety in *U. S. Aviation Brand Piston Rings*. They reach their goal in perfect condition and can repeat the feat over and over again.

#### Here is proof from a notable authority:

Extract of letter received from Mr. Arthur Nutt-Chief Engineer and Vice-President of the Curtiss-Wright Corporation, on the completion of the recent world's endurance flight record:

"We found these rings in excellent condition and their worth was well demonstrated by the lack of carbon in the cylinders, and the good compression in the engine after its long run. The rings appeared good for many hundred additional hours."

All flying aces know *U. S. Aviation Brand Piston Rings* for their reliability, perfect performance and long-wearing qualities, and are giving them preference when undertaking long or difficult flights.

#### U. S. HAMMERED PISTON RING CO. Paterson, N. J.



## LAMBERT-ST. LOUIS AIRPORT

THE ambition of one man to establish an airport for the benefit of his community has resulted in one of the most modern airports in the world. If a modern Aladdin could see the vast difference between the Lambert-St. Louis Municipal Airport of 1931 and the Lambert-St. Louis Flying Field of 1920, he would throw away his magic lantern and go in for hond issues in a bir way.

Standing behind the development of the airport and backing aeronautical events of all kinds, Major Albert Bond Lambert, dean of St. Louis aviation and internationally known aviation enthusiast, in 1920 purchased 169 acres of fairly level land just west of the City of St. Louis

To make the field suitable for airplanes, Major Lambert had a few trees cut down, some mole hills leveled oif and the neighbors' cows moved to other grazing grounds. It was not a pretentious field with its single wooden hangar, but it served better than the narrow, hilly land previously used in Forest Park in St. Louis. On rainy days few pilots dared attempt flights from the muddy ground, and barnster mers found flying business around this mid-western metropolis dull even on sumy days.

Three years later the field was the scene of the International Air Races and the Pulitzer Trophy Race, at which time 243 miles per hour created a world's speed record. The field for this purpose was temporarily enlarged to about 500 acres, with a four-point landing area of 5,000 feet in each direction. The grading, hangars and technical requirements and operation incident to an event of this kind involved the expenditure of \$315.

#### By Russell W. Sexton

000, which, in those pioneer days, also set a record.

Subsequently, the field was reduced to its original size, but there remained certain physical features to insure potential development and the eventual enlargement of the field again.

During 1923 and 1924, activities remained at a standstill, with air circuses doing their bit to make the citizens of St. Louis air-minded. In 1925, the air mail between St. Louis and Chicago was inaugurated under contract with Maj. William B. Robertson of the Robertson Air-craft Company. About this time the Thirty-fifth Division Air Unit, National Guard of Missouri, was organized and established on the field. Col. Charles A. Lindbergh was an air mail pilot on the Chicago run and an officer in the air unit for nearly two years prior to his Paris flight.

Through the initiative of Major Lambert and the Air Board of the St. Louis Chamber of Commerce, the citizens of St. Louis, in keeping with their recognized and established desire to help the city's prestige, in 1928 overwhelmingly passed a two-million-dollar airport bond issue, and without loss of time acquired the original field and additional land to total 546 acres

The field was dedicated by Rear Admiral Richard E. Byrd on July 12, 1930, and is known as the Lambert-St. Louis Municipal Airport in honor of Major Lambert. The naming of the field after

Major Lambert was in appreciation of his activities since 1907 in unselfish devotion to the cause of aviation in St. Louis.

The enlarged field has been made into a major airport and was the first in the United States to complete its technical tacilities for an AIA rating. It is three miles from the Missouri River and can readily be recognized from the air by its large white circle, other airport markings and distinguishable system of hard-surface runways.

The six-point runway system, extending over 3,000 feet in each direction and level with the ground so the runways may be easily crossed, is merely supplementary to an all-direction field in case of extremely wet weather.

A concrete mat or apron 2,500 feet long and 200 feet wide serves the hangars of the air mail and passenger lines, flying schools, passenger depots, weather bureau, restaurant and executive buildings. Hard-surface taxi lanes lead to the runways. At night red obstacle lights show on all buildings and poles bordering or in the vicinity of the field; white boundary lights reveal the landing area. A revolving beacon is in constant operation, supplemented by a 4,000,000 candlepower floodlight and other units of a night lighting system.

A Department of Commerce radio station is located a short, but safe distance from the southeast corner of the airport and red obstacle lights indicate the towers. A radio range station is also located on the southeast corner of the field, about 800 feet outside the white boundary lights but well off the line of

(Continued on page 94)



A six-point runway system, 3,000 feet in each direction, is merely supplementary to the all-way field at Lambert-St. Louis Airport



# Ground Safety is as important as Air Safety

Of what avail are the intricate instruments perfected by science for safety in air flight—if danger lurks in the airport?

Gilmore engineers have developed several methods of surfacing for takeoff runways and landing areas with the use of Gilmore Special Asphaltic Airport Oils, that provide the maximum of safety regardless of weather conditions. They are durable, impervious to water, unaffected by heat or cold. Let Gilmore Engineers solve your problems . . . Gilmore Oil Company, 2423 East 28th Street. Los Angeles. California.





## THERE IS A PLACE FOR YOU IN AVIATION

You are equipped with the proper theoretical and practical training

LD man depression is causing many a young man-and woman-to worry about his or her job and the future. A little worry is good for all of us if we

worry in the right direction.

You probably are worrying about your job right now. You are asking yourself, "How long will it last . . . is my particular line of business strong enough to weather the depression . . . will it stand up under another depression when it comes . . . is my particular job important enough to keep me always employed?"

Analyze your job yourself. If you are not satisfied, do something about it. That's where a little worrying helps.

Look at the aviation industry. The depression didn't paralyze it. It can't-because aviation is too young. Too much progress is vet to be made. Too many new uses for aviation in mercantile and industrial fields are still to be developed. For years to come aviation will forge ahead in spite of all odds. This is where you belong.

You are reading this magazine because you are interested in aviation. You have read this advertisement so far because you are interested in bettering your future. Now go a little further and mail the attached coupon for complete details of the Solo System of Flying Instruction. This famous method of training will equip you for your place in aviation in a shorter period of time than the ordinary course will, and at considerably less money. You need not give up your present position while studying, either. The Solo System was developed

> by Lieutenant George Rockwell from method he used in training Army fliers when he was in charge of training at Fields 1 and 2 at Issoudun. France, du World War. during the



No. 1, the Private Pilot's Course, which can be completed in from two to three weeks costs only \$195 completed in from two to three weeks costs only \$8.75 cash, no terms. No. 2, the Manufacturing and Mechanic's Course which includes thorough welding instruction, costs only \$250. No. 3, the Airplane and Engine Mechanic's Course, one of the most complete of its kind, can be had for \$150. No. 4, our Special

Combination Course-including Private Pilot's Course, Combination Course—including Private Fliot's Course, Manufacturing, etc., repairing and training to instruct— costs \$399. The last three courses are offered on terms—50% cash, the balance in easy, progressive payments.

Living accommodations available at moderate prices con venient to manufacturing plant and airport.

#### START THIS COUPON WORKING NOW

Lieutenant George Rockwell, President Solo System of Flying Instruction, Inc. Institution of Aeronautics, Inc. 1780 Broadway, New York.

Your comments regarding aviation struck home. I want to know more about your school, particularly the course which I have checked.

| No. 1 🗆    | No. 2 🗌  | No. 3 🗌 | No. 4 🗆 |
|------------|----------|---------|---------|
| Name       |          |         | Age     |
| Address    |          |         |         |
|            |          |         |         |
| Present Oc | cupation |         |         |

## Use of Air Travel Tickets

By Warren J. Gore, Globe Ticket Co.

IKE any other passenger transportation business, flying needs accurate and efficient ticket systems for the proper accounting of its volume of trade and for the convenience of patrons. Moreover, in air operations management, the correct use of tickets has a definite value in the promotion of passenger travel on scheduled or unscheduled planes. Now that more and more attention is being given to flying as a business, the importance of well-organized ticket systems to air passenger transport operations is apparent.

The following quotation from Pitcairn Aviation, Incorporated, sums up this phase of the advantages of ticket systems:

"The use of consecutively numbered tickets has a great advantage in giving an accurate check in our bookkeeping department on cash receipts of each of our flying fields; a check on the time our ships are in the air, and a record of passengers carried during certain periods.

"With regard to the books of students" instruction tickets, our experience with these has been very good. They provide an accurate check on instructing time for each student, and, in total, for each operating company in our chain. gether with the flight reports this ticket record enables us to check the income from instruction for each company (of which we have five in addition to the air mail company) and provides us with a basis upon which to estimate business ahead. They provide our bookkeeping department with the record of the pilots' flying time, in addition to the regular check on their own book work, which is quite an important item when one realizes the complicated nature of our accounting system."

The above has been proved to hold good whether the system be applied to a small field operator, even a one-ship operator, or to a large operator with a fleet of ships and stations all over the country.

mission, passenger hops, student instruction and city-to-city transportation. In addition to these advantages, tickets have a definite sales value. How this applies varies, of course, according to the type of passenger.

First, there is the pleasure passenger who may be taking a short hop as his first flight or who may be an occasional customer. These people often fly from the various ports which they visit on their trips and may even see how many different ports they can boast. To such customers, the Globe souvenir flight ticket, originated by my company, has a strong appeal-particularly when the pilot signs the souvenir stub.

All of them need tickets for public ad-

Passengers on regular scheduled trips are the people upon whom aviation must depend for future growth and expansion. They have adopted the airlines as a means of transportation for business or pleasure just as they would patronize the railroads. Such passengers will not be impressed by souvenir tickets, but a regular, businesslike ticket system will have definite sales value for them. It will remind them of the dependability and the safety of scheduled flying today. Even so small a detail as a ticket may serve to put your airline upon the same accepted basis as the railroad.

Air taxi passengers may be of either of the first two types. The ticket to use is a modified souvenir flight form with a space on stub on pilot's coupon for starting point and destination.

We now consider the city-to-city ticket for regular scheduled trips. There are two styles-round trip and one way.

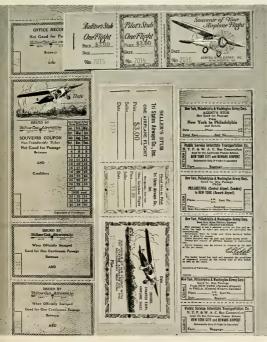
The round trip contains five stubs so arranged as to be detached in sequence during passage. Where the airway corporation furnishes bus transportation to the hangars, a stub is inserted to be detached by the bus operator. This arrangement was made to facilitate auditing of the bus company's account with the airway corporation.

These tickets are put up in pads of twenty-five and fifty to facilitate merchandising through hotels, ticket agencies, travel bureaus and the Pennsylvania Railroad.

A distinctive Globe safety tint can be used for each terminal, so that all tickets can be sorted as to point of origin and an audit made with infinite ease and rapidity. On the back are printed the conditions agreed upon by airway company and passenger.

#### Airline Has 7,093 Offices

A MERICAN AIRWAYS, INC., has made extensive arrangements to facilitate purchase of tickets over its system. Aside from the forty offices of the company, it is possible to purchase American Airways tickets at 625 hotel, travel and tourist bureau agencies, 3,000 Postal Telegraph offices throughout the United States. 1,400 Western Union offices and at 2,028 Missouri-Pacific Railway offices.



Group of typical tickets specially designed for passenger flights and air travel.

#### CURRENT AIRPORT AND AIRWAY FACTS

Two Airlines Equip Transcontinental Routes With Radio-Telephone

I NSTALLATION of two-way radiotelephone services by airlines continues, two of the large transport companies having now completed equipping transcontinental routes.

United Air Lines has completed what the company claims is the most extensive set-up of radio telephone here or abroad. Thirty-two stations have been established and 120 airplanes equipped.

American Airways has accepted delivery on equipment needed for the final link on its transcontinental air route. Installation of Western Electric transmitters for three ground stations at Cleveland, Buffalo and Albany will close the gap in the company's communications system from New York to Los Angeles.

Pennsylvania Air Lines has contracted for equipment from the same manufacturing company to install beacon and weather broadcast receivers for its planes.

#### Transport Companies Establish New Mail and Passenger Routes

THREE new services were begun by transport companies on August 1, improving transcontinental schedules and providing a new international air mail and passenger route.

On this date, also, service to air travelers was further improved by arrangements with Western Union, whereby passenger reservations may be made through that company without charge to the customer. A similar arrangement with Postal Telegraph was announced earlier in the year.

The first international air mail and passenger service between the New England scaports and the Maritime Provinces, on a direct route between Boston, Portland, Bangor, Calais, St. Johns (New Brunswick) and Halifax (Nova Scotia) was inaugurated by the Pan American Airways System. The service operates six days weekly in each direction and reduces travel time between

New York and Halifax to six hours.

Amphibion equipment is used.

American Airways has placed two
mail and passenger planes each way into
daily service between Cincinnati and
Cleveland by way of Dayton, Columbus
and Akron, affording service of twentyfour hours between Fort Worth, Atlanta
and New Orleans to the eastern centers
of population. The company has also
begun the transportation of passengers
over its mail route from Cleveland to
New York by way of Buffalo, Rochester,
Syracuse, and Albany, giving this company a continuous airline between New
York and Los Angeles.

Transcontinental and Western Air has inaugurated two additional round trips between Philadelphia and Pittsburgh and between Philadelphia and New York. The constant demand for reservations between the two points which could not be accommodated by the regular transcontinental and Chicago planes, occasioned the new schedules.

#### New York-Chicago Twilight Schedule of United Air Lines Profitable

I NAUGURATION of a twilight passenger service on National Air Transport subsidiary of United Air Lines between New York and Chicago has resulted in 65% occupancy of seats available. This service affords the first night flying with passengers on regular schedule in the East. This company is also operating two all-air schedules from New York to San Francisco.

#### Department of Commerce Adopts Marker For Auxiliary Landing Fields

A STANDARD marker for auxiliary landing fields has been adopted by the Aeronautics Branch of the Department of Commerce. It consists of a white or chrome-yellow cross made up of two straight strokes four feet wide by fity feet long, intersecting at right angles at their mid-points. The Aeronautics Branch recommends that the marker be placed near the center of the

landing area and that it be constructed of crushed stone, gravel, or other wear-resisting material, used on conjunction with a suitable binder to prevent displacement. The marker should finish the surrounding surface.

These fields are not intended for regular use but have been designated by the owner as available for landing and taking off at the risk of the pilots. There are 199 such fields in the United States and sixty in Alaska.

#### New Planes For Airlines This Year To Cost \$5,000,000

A MERICAN air transport lines will buy \$5,000,000 worth of equipment before the end of this year according to an estimate made by the Aeronautical Chamber of Commerce of America. Inc.

This organization has calculated the retirement of machines as well as the necessary expansion and has concluded that 247 new planes must be purchased to support the services in operation. Only 506 old planes will remain in service, according to the survey, including forty-one 1927 models; 106, 1928; 291, 1929, and sixty-eight, 1930 planes.

#### New Automatic Control of Lighting Developed by Westinghouse

T O enable the intensity of natural light to control artificial lighting automatically, a new photo-electric lighting control relay has been developed by the Westinghouse Electric and Manufacturing Company. When the intensity of daylight decreases to a certain point, this device operates to turn on electric lights; and conversely, when the natural light increases to a certain intensity, it causes the lights to be turned off.

The device is especially useful in floodlighting, airport lighting, and navigation lighting installations.

#### Three New Curtiss Condors Soon Ready For Eastern Air Transport

THREE enw Curtiss Condor transports will soon be delivered to the Eastern Air Transport, Inc. These ships are faster and more luxurious. They carry a payload of 2,800 pounds at a cruising speed of 125 miles per hour.

Among the improvements affecting performance of the latest Condor are better streamlined nacelles, landing gear fairings, and use of wing fillets and strut cuffs. The new ship has a high speed of more than 145 miles an hour. Curtiss controllable pitch propellers are said to raise the ceiling of the ship functioning on one engine to 3,500 feet.

Approximately eight square feet of floor area per passenger is provided by the new Condor. Each chair is equipped with fixtures for individual luncheon trays and card tables. Considerable attention has been paid to sound deadening and heat insulation of the cabin.



One of three new Curtiss Condors nearing completion for Eastern Air Transport



I is the making of various types of transportation equipment, soundness of structural parts has always been a leading consideration. Wherever seamless tubing has been a part of such equipment, the service has usually been exacting. In recent years the uncompromising requirements of aircraft design have imposed still greater demands upon tubing, now generally used for the fusilage construction.

In the manufacture of NATIONAL-SHELBY Aircraft Tubing, all the accumulated knowledge and experience of the largest manufacturer of tubular products in the world are concentrated on the one object—reliability. Every foot is subjected to the most rigid inspections and tests and is both physically and chemically made to conform to United States Army and United States Navy Specifications.

Structurally sound—you know that in advance when you specify NATIONAL-SHELBY Aircraft Tubing! Available at important supply centers in all parts of the United States. Ask for descriptive literature on—

America's Preferred Aircraft Tubing

YOU KNOW

THAT IN

ADVANCE

**NATIONAL-SHELBY AIRCRAFT TUBING** 

# PERSONAIRLITIES

WHEN I was a callow youth collecting my first impressions-this was years and years ago, when Sitting Bull was still known to his friends as Lying Calf, and free lunch counters dotted the land as hot dog stands do in this decadent age-when I was very young, then, life seemed earnest and full of meaning. My path toward success lay straight ahead in an undeviating lineall I had to do was to follow it and in time I would be President of the bank. (At the moment I was the bank's messenger.) Somehow or other, though, I skidded into the theatrical profession. Then my purpose was to produce musical comedies of a high order, practically driving Dillingham and Ziegfeld out of business. I saw no reason why I shouldn't become the great impresario of my day, but evidently the public saw no reason why I should. I produced one comedy, but nobody'd believe me-and on the second week I also agreed it was a tragedy. Then followed a few weeks as a vaudeville monologist-equipped with the worst, positively the worst monologue ever got across-in fact, it never actually got across anywhere except in New Glasgow, Nova Scotia, where I put on a benefit performance at the county insane asylum where so many of my relatives were staying that they made a friendly audience.

Well, no need to go on. What I'm trying to get over is that by now I find no meaning in anything. I'm not unique in starting to be one thing and ending up as something else again. The procedure seems chronic in us all. For instance, Wesley L. Smith, now Chief Engineer of National Air Transport, spent five years and five thousand dollars learning to be a concert singer-and then became a pilot. Incidentally, many young men have spent \$5,000 learning to be transport pilots-and now may be concert singers or anything else they desire-except transport pilots. It's a funny world, folks. If you discover the meaning of it-any meaning at all-drop me a post card. I think any meaning you find you will be able to get on a post card, or even on a postage stamp. Science discovers a little of the How, but not a bit of the Why of life. And as for theology-well, it's still making all clear to the dwellers in the more backward rural regions, but in the cities it has dodged about and has changed into a mere code of ethics, also subject to change.

I was reminded of all this when suddenly confronted with a photograph of Tom Truesdale in his uniform—a somewhat staggering affair reminiscent of the noted Colonel Roscoe Turner in his palmy days. It appears to be an officer's uniform, with Sam Browne belt and shoulder straps and metal buttons, however, I do not recognize them as belonging to any military organization known to



me-unless perchance it is the Betsy Ross Opal Kunz Corps. The emblem is rather indistinct in the picture, but appears to be a broiled live lobster, rampant, on a field as you were, with two sprigs of parsley below and a piece of lemon above. Or perhaps it's a sliver of French Fried—I'm sure I don't know.

However, this would be a most suitable insignia, for Tom is much about the night



Tom Truesdale, Musical Aviators leader

clubs and places where people dine to music —including crooning as a counter-irritant. He is leader of the only flying band in the world, the Musical Aviators Orchestra, eleven good men and true, including himself and uniform. All are pilots, or somewhere along in that direction, having toyed with the air above Valley Stream for a number of years, learning the intricacies of piloting and airplane gadgets. Mayhap there are a couple of Walter Hinton's graduates here somewhere—I don't know, but probably there are. Walter has graduates everywhere—I thought I had found one

in my ice box the other day, but it turned out to be a beetle that had been too hot and had gone in there to cool off,

Anyhow, this Tom Truesdale got off to a bad start as the son of a Methodist minister in Charlotte, N. C. Most ministers' sons, you know, suffer so much from piety at home that when they finally escape they simply wallow in sin as a sort of mental catharsis. So it is not surprising to see Tom sinking lower and lower until he finally ends up waving a baton over a crooner. A baton, by the way, is not the implement to wave over a crooner-it isn't heavy enough. But let that pass. The point is that Tom is now the leader of a band of lost souls who have strayed from the hymns of childhood to sink among jazz rhythm. This must be a sore trial to his father, the good Dr. R. S. Truesdale, of Charlotte, N. C .- no lilv of a town itself, despite the Doctor's ministrations, as the memory of one wild night long ago still assures me. I was a minister's grandson, by the way, so I know what the world, the flesh, and the devil does to us lads from the parsonage. However, donning the cloak of virtue for a moment. I may say that I never sank to crooning-a mean bass in a bar-room chorus was the limit of my depravity.

Tom Truesdale was born in Columbia. South Cah'linah-if I haven't mislaid my Southern accent-some 27 years ago, and was educated in the South, a process generally believed to lay a high polish on the lucky subject. Some four years ago he got all stirred up about aviation and passed the examinations for Kelly Field, but before they could ship him out there he got an offer to take his orchestra to Europe. It seems someone had carelessly left a violin around when he was a child, and he had slid from grace and the family organ. Anyhow, there he was with this orchestra, off to Europe, where he played before audiences of notables and ordinary run-of-the-dump dancing couples. His press agent tells me that Tom played before ex-King Alfonso of Spain. Whether this in any way contributed to the ex part of it, I don't know, but if John Mayo of the Columbia Broadcasting System did the announcing I am willing to believe that the King was thereafter unfitted to attend to his duties, leaving his subjects nothing but to give him the air.

Tom and the lads played all the noted loafing places for expatriate Americanos, including the Martinez at Cames, the Ambassadeurs in Berlin, the El Garron, Hermitage Muscovite, and Blue Room in Paris, the Maipu Pigalls in Madrid, and the Casino in Deauville—where I once lost ten francs at roulette, which nearly broke my heart. Then he returned to the States, was a head-

(Continued on following page)

## Here's a real



## For profitable short-haul flights

With every airport thronged with people who want to "go up," here is an unusual opportunity to cash in on the public's air-mindedness.

For immediate sale we have made some very attractive low prices on a few Super-Universals and other Fokker planes that have been used as demonstrators, including—

SUPER-UNIVERSAL F-14A MAIL PLANE STANDARD UNIVERSAL F-10A TRIMOTOR

The Super-Universals are an especially profitable "buy" for feeder lines, sightseeing, charter and taxi

work. They have six pay-load passenger seats and baggage or lavatory room. Extra-sturdily constructed and powered with a Pratt & Whitney 42s h.p. "Wasp" motor, they are built to stand the wear and tear of short hops — economical to operate. speedy, durable.

All these ships are in first class mechanical condition. They can't be told from brand-new planes and each is fully guaranteed. If you would like to purchase a fine ship at a worth while saving, write for prices. They won't last long.

## FOKKER

DIVISION OF GENERAL AVIATION CORPORATION

FOKKER AIRCRAFT CORPORATION OF AMERICA, GENERAL MOTORS BUILDING, NEW YORK

(Continued from preceding page)

liner in vaudeville and toured the country in a Curtiss Condor to keep the engagements. Last winter he played to the diners in a New York Hotel so they wouldn't notice what they were eating, and broadcast 168 times over the Columbia Network. I suggest that more pilots take up the study of the saxophone—it would relieve the unemployment situation in aviation. The unemployment in musical circles at least would be a change to the famished pilot.

THE passion for law enforcement in this unhappy land grows apace. Just why it should be, I don't know, but in the one widely advertised land in the world where liberty is supposed to be on tap, there are more agencies for making and enforcing and evading laws than there are in any other corner of the globe. Everybody, it seems, is bent on making everybody



Cliff Henderson

else behave; but I don't suppose it matters, one way or the other, because hardly anybody pays attention to these efforts.

The latest cruits to the Big Stick movement are a flock of old broken down pilots who are still, despite great age and rapidly advancing senility, clinging desperately to the surface of the earth at Cleveland, Ohio - permanent thorn in the flesh of Los Angeles, California, on ac-

California, on account of the National Air Races. These old gummers—there isn't a sound tooth in the lot of them—are banded together in a tottering, shaky fashion under the imposing cognomen, CLEVELAND AIR POLICE

Their avowed purpose is to enforce the air laws of the country, somewhat after the manner of the New York City Air Police. The Cleveland Air Police, however, are a voluntary force, serving for nothing. All of them, I believe, are getting what they're worth, I know nearly all of them personally, and I have no hesitation whatever in stating that if they wanted to arrest me and I didn't want to be arrested, the chances are about two to one that I wouldn't be in jail. That is, allowing that they went after me one at a time. Of course, the whole force, working in collusion, could probably get me behind the bars, after a few minor casualties. And there's one member, Jerry McClelland, who might manage the trick alone if he happened to fall on me-because he once tripped over a box-car on the railroad and flattened it out in an instant. But take them individually, I don't believe they could manage it. And I'm not boasting of

my own prowess, either, because I'm practically falling apart myself. Only, I haven't fallen as far apart as most of these birds. But let's look them over and you'll see what I mean. All are policemen, remember.

The Flight Commander and Captain of this desperate band is Clifford W. Henderson, a lieutenant in the U.S. Army and a Captain in the Reserves. Anyone who has ever seen Cliff and me standing together will appreciate the problem Cliff would have on his hands if some one suddenly pointed at me and said, "Arrest that man!" In the first place, Cliff would have to go get a step ladder before he could place an arresting hand on my shoulder; and in the second place, if I wanted to move away from there I don't see that there would be much, outside of perhaps shooting me, that Cliff could do. And after all, shooting a man isn't arresting him-it's shooting him. The problem here is not to shoot him, but to arrest him and march him off to the hoosegow. And suppose I simply sat down and said, "Well, go ahead and carry me to the station house." Could he do it? I only weigh about sixty pounds more than he does, and my feet drag, even when I use them myself for walking. Each foot weighs twelve pounds.

Before I go on to the other members of this fearsome force, let me tell you something about Police Captain Cliff Henderson, who was born July 11, 1895, at the rising town of Lennox, Lowa. This makes him over thirty-six years of age, which I submit is pretty late in life to be joining It be police, even as a captain, who usually is a broken down patrolman rendered unfit for further service on account of flat feet and too many meals prepared by too many affectionate cooks on his beat.

Captain Clifford was educated to some extent in the grade schools of lowa, but received a finish in the Manual Arts High School in Los Angeles, California, and the University of Southern California. During the war he served in the Ambulance Corps, and contributed mightily to the sacred cause by splashing mud on passing troops. He transferred to the Air Corps just before the Armistice was signed, apparently timing the transfer beautifully.

After the war he purchased a Jenny and did other things natural to a youth of spirit, for which we shouldn't blame him. He now owns a Great Lakes Racer in which, unless I am mistaken, he has won no races. He was chairman of the ground arrangements committee of the 'round-the-world flight at Santa Monica. The fact that the fliers eventually did get around the world was probably due in large measure to Cliff, who stood on the airport to guard against any Los Angeles real estater cutting it up into lots while the planes were making a landing. If it hadn't been for Cliff, the 'round-the-world flight would have ended right there in a subdivision, instead of going ahead to end in oblivion, the natural destination of all flights except those made by Charles Augustus Lindbergh.

Cliff had an automobile agency in Santa Monica in which he was preparing to starve to death gracefully when the National Air Races at Los Angeles descended upon him like manna from Heaven. It dropped in a gentle rain of simoleons on Cliff, his relatives, and his immediate friends; so that today even Solomon in all his glory was never arrayed like him in a white Cord car and shiny field boots. For four happy years the manna has descended, to the delight of Cliff and his host of retainers, serving men, court jesters, radio announcers, peanut venders and ushers. And as managing director of each annual National Air Race, Cliff has functioned with all the power and prestige of a monarch of old. He is the late Tex Rickard, complete with wings, combined with the late P. T. Barnum, and a pair of goggles.

Well, he's a good manager. Before he managed them, the National Air Races always were a financial disaster to the underwriters; now they invariably show a profit. Furthermore, under the Henderson dictatorship the things are actually satisfactory to the public, which they never were prior to 1928. To appreciate Cliff Henderson it is only needful to look back to the Dayton Races, the New York Races, and the Philadelphia Mud Baths to see what Cliff has done to alleviate human misery and suffering. As a police captain he is undoubtedly a good air race manager.



EXT on our roll of enforcers of the good old law—with the natural exception of the prohibition law—is Captain Ephriam Wilberforce Cleveland, more familiarly known as "Pop" Cleveland, Pop is a hold-over from the Pliocene era, a descendant of the Family Pliosauridae. This old Pliosaurus survived the Great Ice Age by hiding in the swamps of the Cuyahoga



E. W. Cleveland

Valley, buried to the neck in mangrove roots and empty tomato cans. Here he dug in his toes, held firm, and snorted defiance while the glacial debris passed over him. He was headed south at the time as is clearly evidenced by the manner in which the glacier has pushed

his ears outward and forward, giving him the alert appearance of a bull moose testing the wind. Upon the passing of the ice, however, Pop leaped upon the back of good old Pliohippus, the fossil horse of that period, and made good his escape. He galloped off to New York State and only returned when he learned about Aerol Struts.

Pop, whose brief biography has appeared before in these veracious columns—to Pop's great pleasure, I understand—was in the days of what he calls his youth an instructor

(Continued on following page)



## Proof that VON HOFFMANN

### Graduates are Readily Accepted

On file in our office are many letters from graduates telling of their more ready acceptance for positions because they were Von Hoffmann trained.

Below are excerpts from two of them:

Mr. T. H. Worthington writes that he got a job as soon as he graduated. In writing about the incident he says—"Just as soon as I stated I graduated from Von Hoffmann Air College, I noticed they took more interest in me.

Mr. Richard McDougall, another graduate who is now an instructor in another school, writes—
"When I told them I graduated from Von Hoffmann they gave me the job."

Located on the famous \$2,000,000 Lambert-St. Louis Municipal Airport

### VON HOFFMANN AIR COLLEGE

440 Lambert - St. Louis Municipal Airport, St. Louis, Mo.

U. S. Department of Commerce approved School for Transport, Limited Commercial, and Private—Ground and Flying THEN you can be certain of your ready acceptance into this modern industry. For the type of training you get — its thoroughness and completeness are scrutinized very closely. Aviation is looking for capable men. But positions of responsibility require men who have learned every phase of each problem they will be called upon to face.

The practical training given at Von Hoffmann has proved itself repeatedly. 97% of all of our flying students pass Government tests on first trial. That is a record you cannot overlook.

The Von Hoffmann Air College is one of the few schools in the country with the highest Government rating. This rating was awarded only after the Government made a careful study of our equipment, instructors, and system of training. It is your guarantee of the best training.

If you are over 16 years of age send in the coupon below and we shall send you full particulars.

| VON HOFFMANN AIR CO<br>440 Lambert-St. Louis Munici |                    |
|-----------------------------------------------------|--------------------|
| St. Louis, Missouri. MAIL TO                        | DDAY               |
| i                                                   |                    |
| Name                                                |                    |
| Address                                             |                    |
| City                                                | State              |
| Age                                                 | am interested in   |
| ☐ FLYING COURSE                                     | ☐ MECHANICS COURSE |
| ☐ Welding Course                                    | ☐ Home Study       |
|                                                     |                    |

(Continued from preceasing page)

in the United States Army Air Service. He has over 7,000 hours in the air, charitably speaking, and admits that he is at least fortytwo years of age. That is, he admits that he has been here forty-two years during this reincarnation, though there is not a doubt that, regarded as a fossil, he dates back some 50,000 years, to put it mildly.

And this is captain number two of the law-and-order brigade. I defy him to arrest me-and get away with it.



HE third captain bold of this police force is Gerald H. McClelland (whose picture we showed you in these columns last month), the airport engineer who is equipped by nature to act as his own steam roller when necessary. He weighs about 275 pounds on the hoof, more or less, though I am inclined to believe it is more. Whatever it is, it is less than it was a while back, for he writes from good old Los Angeles, the town with a perfect climate:

"I have certainly played the part of a real laboring man out here. Ever since my arrival I have been out at Mission Airport in the blasting sun from eight in the morning until five or five-thirty in the evening, and not being used to it, it sort of whittled me down. It has been hotter than the hinges of hell out here, and I am getting to the point where I would give a million dollars to see a cloud the size of your hat. I am going to fly east to the Races with either Dudley Steele or Bernie Wickham with one of the debris-thus endangering my standing in the league of aviation executives."

Jerry is over standard Pullman size-in fact, he gave up taking home Pullman towels years ago, and went in solely for hotel bath towels-so if he is to use the trains at all it is just as well that the climate of California in summer should have a whack at him. I wrote and told him that if he got any bigger the Pullman Company would be unable to tote him around, and that he'd have to make arrangements to travel in that special tank car in which the Pacific Coast Whaling Company is exhibiting a full-grown whale. In fact, you know those rubber animals bathers inflate and take in the sea with them at our popular beaches-very large, some of them? Well, a lady said to Mrs. McClelland, "I saw you in swimming at Edgewater Beach with one of those big rubber hippopotamuses," and Mrs. McClelland didn't know what the lady meant, because she and Jerry had been alone in the water that day.

And this is the laddie who at the age of thirty-five with 2,700 hours in the air-probably in blimps-and now a lieutenant, senior grade, in the great United States Navy, and an executive officer at Grosse Ile base; this, I say, is the bird who suddenly decides to become a policeman, and a police captain at that. The idea is startling in its originality. The only thing that baffles me is this: how is he going to arrest anyone? If he approaches a man to lay his hand on the culprit's shoulder, how is he going to reach ahead of his own tummy?-tell me that. He'll reach forward, his tummy will reach still further forward-and the victim will be catapulted out of hand's way.

I give him my hearty permission to try to arrest me. I'll admit that if he trips and falls on me that I'm a goner. But I believe I can evade him, Flight, in this instance, is my surest defense. And I don't for a minute believe that he could catch me. His only plan would be to sneak up on me, lean over suddenly, and flatten me out. But this would be no good either. What would be the use of his appearing in court with a large flat substance, stand it up against the dock, and say, "Your Honor, this used to be Cy Caldwell. His sense of humor frequently went flat on him, so in charity I made the rest of him fit." The case would be dismissed because I couldn't be identified after Jerry had leaned on me only once.



HE doughty-and possibly goutylieutenants in this brigade of bold airmen who enforce the law, perhaps, are Frank Burnside, Warren D. Williams, Lee Peck, Samuel J. Sampson, William B. Atwell and Earl H. Zistell. Captain Herbert B. Wright is flight surgeon, and Lieutenant-Colonel Thos. J. Herbert is provost marshal. The only one of this lot whom I won't dare to arrest me is Colonel Herbert-I don't know him, and he may be bigger than I am. The rest of them can come on, one at a time, and I'll take my chances.

J. P. Buckey, secretary, is a member of the Traffic Division of the Cleveland Police Department-so all he'd give me would be a summons, anyhow. And the treasurer, Clifford Gildersleeve, executive vice president of the Cleveland Air Race Corporation, fortunately owes me some consideration because I once flew him, for nothing, from Cleveland to Los Angeles-so I'm sure he wouldn't arrest me. He's the only one of the lot I'd really be nervous about tackling, for he's a great big powerful brute who could toss me aside like a cold waffle. In fact, it's only his kind heart that prevents him from tearing up a few hangars and piling them on top of Floyd Logan.

In the event that any of the Air Police get too rough with a culprit, the kind gentleman who will



H. B. Wright, M.D.

Flight Surgeon Herbert B. Wright. All the rest of these fellows are phoney policemen, but Doc Wright is a real M. D., having graduated from Harvard in 1923 with that tag attached to him by the faculty. His full name - which

he also uses at other times-is Herbert Beach Wright. He was born thirty-three years ago on a cow ranch in Montana, graduated from the University of Wisconsin in 1919, Harvard in '23, and the Flight Surgeons' School of the U.S. Army Air Corps in 1928. There is practically no doubt that he is a doctor. In fact, the Department of Commerce recognized the fact by making him Medical Examiner in Cleveland. He has examined such perfect specimens of masculine beauty as Dick Blythe and myself, after which he was heard to remark that he no longer regretted not seeing Apollo in his prime-or was it Aphrodite in the Bath?-I forget which.

He was an instructor in medical bacteriology in the University of Wisconsin, and a sergeant in the Medical Corps during the war, when he served with distinction on the front at Waco, Texas, and New Orleans. He has 300 hours in the air, Transport License No. 8683, and is a captain since 1927 in the 37th Division, Air Service, Ohio National Guard. He is married and has one child, Susan, aged two and a half. If I feel ill during the races this year I shall certainly call upon Doc Wright for a prescription.





Frank H. Burnside

N return for the use of this picture of himself in a Thomas Brothers plane at Bath, N. Y., in the early days, I offer good old Frank H. Burnside the privilege of arresting me any time he needs practice as a policeman of the air. I wouldn't have the heart to refuse this old-timer any such reasonable request as the pleasure of throwing me in jail over night; I would just go along with him unprotestingly and I would consider it a pleasure to be arrested by the holder of F. A. I. License No. 212 and Department of Commerce Transport License No. 391.

(Continued on following page)

SEPTEMBER, 1931 81



# All Aviation benefits from Curliss-Wright military achievements

Curtiss-Wright is supplying all types of planes to the Army and Navy Air Services. Building to rigid, strategic requirements of the Bureaus, Curtiss-Wright is meeting their demands for speed, stability and maneuverability.

Its Military and Naval successes and penetrating study of transportation put Curtiss-Wright in the unusual position of constantly applying this experience to improve the performance of every

plane it produces. That is how Curtiss-Wright is constantly adding speed, increasing useful load and obtaining greater economy of operation in its commercial models. • Keep abreast of Aviation's rapid development by letting a Curtiss-Wright dealer demonstrate how Curtiss-Wright experience and resources are built into planes for all commercial purposes—training, sport, business and air transport.



(Continued from preceding page)

Frank Burnside was born at Oneonta, N. Y., August 7, 1888, and according to the records was educated at the College of Music and Utica Conservatory of Musicmuch to my surprise because he doesn't look it. Whether he played or sang, I unfortunately do not know. It is equally hard to imagine him swaying gently as he draws a bow over his violin or tossing his head skyward as he sends a resounding bellow hurtling toward the heavens. Perchance he tooted a saxophone-or were they invented then? I incline to the belief that he played gentle pieces on the harmonica-but this is a mere guess. He may have been a drummer or a jug-player.

He learned to fly in 1911 and soloed in December of that far-off year when a pansy was still a flower and Fanny was a girl's name-how times have changed! During 1912 he did exhibition flying, and until 1915 was exhibition instructor and test pilot for Thomas Brothers, when he joined Glenn H. Curtiss to do special flying until 1923. For the next three years he was test pilot and instructor for Thomas-Morse Aircraft Work at Ithaca, N. Y., until Septemper, 1926, when he began a year's test and experimental work for the U.S. Air Mail at Chicago. From September, 1927, to April, 1930, he was pilot for National Air Transport's Cleveland-Chicago run, when he became test pilot for Smith Engineering Company, Cleveland, and a policeman of the Auxiliary Air Police. He has some 9,000 hours' flying experience.



T never occurred to me until this minute, of course, but I just happened to think that this Cleveland Air Police has all of the ear-marks of a publicity stunt perpetrated by the nimble-witted Cliff Henderson to advertise the National Air Races. I don't suggest for a minute that this really is a publicity stunt.

However, if it really is a publicity stuntas of course it isn't-why not make it amount to something by having the whole Force hop on to and arrest this notorious character from the Far West, whose picture I publish herewith for identification purposes. This hard-boiled old egg is the first United States air mail pilot, he has been flying since 1911-and he is still flying. These are reasons enough alone why he should be jugged.

In this photograph we catch him in a disguise he sometimes affects-that of an honest old cattle rancher, which he isn't, Actually, he's a real estate subdivider, so probably the less said about his honesty the better. He writes me: "Guess I've got my old job again this year-herding the girls across the continent in the women's derby as starter and timer. Nice bunch of girls last year, and think there will be this year.

They choose old birds like me for this job-one foot in the grave and the other on a banana peel."

Which is true enough, girls. But there's no telling which way that other old foot on the banana skin is going to slip-you want to remember that. This old girl herder from away back is called. among other things, Earle Ovington, He and the climate are the most famous things in Santa Barbara, California.



Earle Ovington

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## THE AIR SERVICES

#### NAVAL BUILDING FAVORS AIR ARM

ARGELY for the development of the air arm of the Fleet is the building program of the Navy Department for the fiscal year 1932, announced August 5 by Secretary Adams. The total construction will cost \$129,385,000, of which \$81,080,000 will go to building up to treaty strength the air division of the navy.

The program calls for the construction of two aircraft carriers, one flying-deck 10,000-ton cruiser, complete airplane equipment for the aircraft carrier Ranger now under construction and six fleet submarines, one London Treaty six-inch gun cruiser of about 10,000 tons and one destroyer leader. This is the carefully worked out program of the Navy Department in view of the declared policy of the administration "to create, maintain and operate a navy second to none and in conformity with treaty provisions."

The proposed new aircraft carriers, which, if authorized, will probably be named the Constitution, and the Constitution, in tonnage will be a little more than one-third the size of the aircraft carriers Lexington and Sarataga, which displace 33,000 tons each. The new aircraft carriers will cost \$27,650,000 each or a total of \$55,300,000 with all air equipment installed.

The flying-deck ctuiser would be the first vessel of this type built for any navy. This ship will not be an aircraft carrier within the definition of the London Treaty, but rather a six-inch gun cruiser with a flying deck from which a number of planes can be operated. Being within the 10,000-ton cruiser class and armed with guns of less than eight-inch calibre, its speed would approximate that of the cruisers in commission and building, exceeding thirty-two Inots. Such a ship as planned would cost \$20,780,000.

A total of \$5,000,000 is appropriated for the equipment of the new aircraft carrier Ranger, now under construction at Newport News, including 114 planes, spare parts and accessories

#### Announce Winners of Naval Aircraft Gunnery Trophies

AIRCRAFT gunnery trophies for the naval competitive year ending June 30, 1931, have been won by Fighting Squadron 3, of the U.S.S. Langley; Observation Squadron 9M, stationed at Port au Prince, Haiti; and Torpedo Squadron 7F, attached to the U.S.S. Argomne. Each of the three victorious squadrons will be awarded an individual bronze plaque by the Navy Department and will retain possession of it during the present competition year.

Fighting Squadron 3, attached to the U.S.S. Langley and winner of the trophy in the fighting plane class, was commanded

during the gunnery year by Lieut.-Comdt. Gerald F. Bogan, U.S.N. During 1929-1930, this squadron won the Schiff Trophy, which is awarded annually to the aviation unit with the greatest number of flying hours without serious injury to personnel or material.

Observation Squadron 9M, attached to the First Brigade Marines, Port au Prince, Haiti, was commanded by Major James E. Davis, U. S. M. C., during the past gunnery year. This is the second consecutive year Squadron 9M has won this trophy.

VP Squadron 7F, attached to the U. S. S. Argonne, flagship of the Base Force, U. S. Fleet, was commanded by Lieut.-Comdr. G. R. Fairlamb, U. S. N. This is the second consecutive year that this squadron has won the trophy for its class, which includes torpedo, bombing and patrol types.

Trial Flights of Akron Begin in August TRIAL FLIGHTS of the navy's new dirigible Akron will be inaugurated on or about August 31 at the municipal airport, Akron, Ohio, according to a recent announcement of the Navy Department. The

trials will be conducted for a period or approximately one month by day or by night. No fixed itinerary will be followed.

Every precaution for safety will be taken during the trials and airplanes must keep at least 1,500 feet from the airship at all times. Only emergency landings and scheduled operations by heavier-than-air craft are permissible at the Akron airport while the Akron is docking or landing, and all other aircraft will be grounded.

The full cooperation of all pilots has been requested. On days when trials are to be made information to this effect will be sent over the teletype.

#### West Pointers to Study Flying

A TOTAL of eighty-nine newly commissioned second lieutenants of the Army, who graduated from the U. S. Military Academy at West Point in June, or thirty per cent of the entire graduating class of 296, has been detailed to the Air Corps for the purpose of undergoing flight training.

They will report on September 11 to the new Air Corps training center at Randolph Field. Texas, for duty as students.

#### MOFFETT SPONSORS HIGH-SPEED PLANES

R EAR ADMIRAL WILLIAM A. MOFFETT, Chief of the Bureau of Aeronautics, Navy Department, advocates a high-speed development program for Naval Aviation in a statement recently issued. If the United States is to regain the world's aviation speed laurels from Europe, more money must be provided. The \$220,000 authorized by the last Congress for a high-speed program virtually will be used up by the development of an engine alone.

The purpose of such a program is not solely to build racing planes, Admiral Moffett said. The Navy Department needs speedier aircraft for service use if the United States is to reach air parity with the aviation services of foreign navies.

"The Bureau of Aeronautics has consistently advocated a policy of high-speed development. It produces direct and immediate competition; it stimulates creative thought; the results obtained are directly applicable to service aircraft.

"Congress made available on July 1, 1931, the sum of \$220,000 for high-speed development. No funds had been included in recent appropriation acts for this important project; consequently, it will take several years to reach the status existing abroad. The time for accomplishing results will depend upon the talent available as well as the amount of funds appropriated. The \$220,000 already authorized has permitted the Bureau of Aeronautics to contract only for the first stage in the development of a light-weight, high-powered engine.

"In addition to the engine program, there is required research mainly in the aerodynamical form, the most efficient structure to support the applied forces and the propeller. Preliminary studies are now being undertaken to determine the proper line of research for solving these complex problems. When funds are available, they can then be undertaken. All existing facilities will be called upon for their appropriate share of the work. For example, the new towing basin of the National Advisory Committee for Aeronautics at Langley Field will conduct the investigation to determine the most efficient aerodynamic form.

"As stated, the results from a high-speed development program are directly applicable to service aircraft. Now the service is in need of an engine of about 1,000 horse-power for patrol planes and airships. If the development program develops, say, an engine of 2,500 horsepower, it will, with minor modifications make a most reliable 1000-horsepower service engine.

"Preliminary studies have created a new design for patrol plans which will improve their performance; already, returns are being received from the stimulating effect of the high-speed project.

"Funds expended for a high-speed development program is money well spent. It is an economical method to insure that our

service types of aircraft are being maintained at the maximum performance. Our country demands the best.

"Let us speed up this program-more funds are needed."



# CORSAIRS See

Vought Corsairs see the world with the Navy. For Corsairs are always with the fleet—wherever it may go.

In service with the aircraft carriers, Corsairs take off from steel decks—which are often far from steady runways—and land into relentless arresting gear. Corsairs are catapulted from the battleships and cruisers. They land in rough and choppy seas and are hoisted aboard by cranes. Service like this demands stamina and handling qualities far beyond the requirements of ordinary flying. And the way the Corsair meets such

demands has made it a standard observation plane of the U. S. Navy.

Combine the structural strength of the Corsair with its exceptional speed range and ease of handling and you have a plane ideally suited for fast executive transport and private flying. Chance Vought Corporation. Division of United Aircraft & Transport Corporation. East Hartford, Connecticut. Export representative: United Aircraft Exports, Inc., 230 Park Ayenue, New York, N. Y.





(Army Air Corps Photo)

Close-up of dismantled freighter during bombing tests by Air Corps off the Virginia Cabes.

Army Bombs Freighter in Test

BOMBING tests in which the discarded freighter Mount Shasta was used as the target were conducted last month off the Virginia Capes by the Second Bombardment Group, Army Air Corps, stationed at Langley Field, Va. Faulty radio communication between the surface craft and Langley Field, mechanical troubles which developed while the target was being towed to the prearranged position and severe weather prevented the experiment on the first day's schedule. The tests were made on the following day.

The planes bombing the Mount Shasta were flown over the target at an altitude of 5,000 feet and bombed the ship both singly and in groups. Light projectiles were used.

#### Service Pilots to Give Exhibitions at National Air Race

PLANES of three Army Air Corps pursuit squadrons will participate in the aerial program of the 1931 National Air Races, Cleveland, Ohio, August 29-September 7, the Air Corps recently announced. These squadrons will be the 17th, 27th and 94th of the First Pursuit Group, Selfridge Field, Mich. The pilots will fly Wasp-powered Boeing pursuit ships. During the course of the air races the Army pilots will engage in formation flying and other maneuvers over the Cleveland Airport.

Service flying and maneuvers will be demonstrated at the National Air Races by Fighting Squadron 3, attached to the U.S. S. Langley, under the command of Lieut.-Comdr. J. E. Ostrander, according to a Navy Department announcement.

#### Forty-five Boeing Fighters Purchased by Navy Department

CONTRACT totaling \$527,947.75 for the purchase of forty-five fighting planes and spare parts has been awarded by the Navy Department to the Boeing Airplane Company of Seattle, Washington. In ordering

these forty-five fighting planes, the Department exercised an option held in connection with a previous contract for thirty planes of the same type, which are designated by the navy as F4B-3's.

The fighters are single-seater planes, equipped with Wasp engines manufactured by the Pratt and Whitney Company of Hartford, Conn. The F4B-3 type is a development of the F4B-1 type of fighter which has been used in the navy during the past two years.

The planes of this new contract, upon completion, will be assigned to the operating squadrons aboard the aircraft carriers of the U. S. Fleet.

#### Test Searchlights for Anti-Aircraft Defense at Fort Humphreys, Va.

THE anti-aircraft searchlight exercises being held at Fort Humphreys, Va., for six weeks beginning August 15, are the most extensive to be conducted since the development of the latest anti-aircraft searchlight equipment. The anti-aircraft troops participating will consist of three searchlight batteries of Coast Artillery each having a strength of three officers and 75 entisted men. Eighteen mobile 60-inch anti-aircraft searchlights and eight sound locators will be used during the exercises.

In addition to the Coast Artillery troops the Air Corps will furnish eighteen planes, including nine attack, six pursuit, and three bombardment.

The particular purpose of these exercises is to test the efficiency of the newest model searchlight, distant electrical control system and sound locators. These new instruments have been in use for some time but have not had previously exhaustive tests under all conditions of field service. The latest anti-aircraft searchlight is a very efficient light which, with the electrical control, is capable of great flexibility in following the fastest planes which may be encountered.

During the exercises the planes will fly at elevations from 1,000 feet to 16,000 feet.

#### Navy Buys Keystone Amphibions

THE Navy Department has awarded a contract to the Keystone Aircraft Corporation, Bristol, Pa., for the construction of seven Keystone-Loening amphibions at a total cost of \$164,062.50. These planes, designated by the Navy as OL-9, are the same type as the fifteen amphibions being built by the Keystone company under a previous contract.

The planes for which the most recent contract has been awarded will be powered with R-1690 Pratt and Whitney engines.

The OL-9 is a two-seater amphibion, equal-winged biplane. The hull is specially reinforced for deck landing and to withstand stress of catapult launching. In the hull is a cabin for a wireless operator.

THE Switlik Parachute & Equipment Company of Trenton, N. J., was recently awarded a contract for 1,285 parachutes by the Army Air Corps, according to an announcement of company officials. The Navy Department recently awarded the company a contract for 200 Switlik Chutes.

#### ANACOSTIA FLIGHT TEST SECTION

PERFORMANCE trials on forty-two airplanes during the fiscal year recently
ended were carried out by the Flight Test
Section of the Navy Department at the
Naval Air Station, Anacostia, D. C. These
included nine fighters, ten observation planes,
six transports, six patrol flying boats, two
torpedo or bombing planes, four training
planes, one scouting plane, one autogiro and
three miscellaneous aircraft.

Commenting on the year's work of the Section, Rear Admiral William Moffett, Chief of the Bureau of Aeronautics, Navy Department, recently issued the following statement:

"The work at Anacostia this past year reflects great credit on the Section's personnel. The mission of this Section is to carry out the flight testing of airplanes, engines, accessories and equipment as directed by the Department, and to submit proper reports thereon. Simply expressed, this means that virtually all experimental machines and the first airplane of each production contract are put through the program of tests and inspections on which is based the acceptance of each type for service use. It is fortunate that we have such a fine location for this work, here, close to the design and engineering experts in the Department. Because of this, discussions of defects or improvements in our planes encounter a minimum of delay."

The Flight Test Section at Anacostia was organized January 1, 1927, on recommendation of the Bureau of Aeronautics. The personnel of the Section at present consists of: five officers, two aeronautical engineers, three clerks, and twenty enlisted men. Lieutenant Ralph A. Ofstie is officer-in-charge of flight tests, and is aided by the following: Lieutenants F. M. Trapnell, J. F. Bolger, R. B. Pirie and T. J. Hedding.

## DIESEL-POWERED BELLANCA BREAKS WORLD'S NON-REFUELING ENDURANCE RECORDS



## Goodrich Low Pressure Tires

permit perfect take-off despite tremendous overload

AT 6:47 o'clock on the morning of May AZ 28, 1931, two seasoned pilots, Walter Lees and Frederic A. Brossy, stepped into their heavy-laden oil-burning monoplane, raced down the wide sandy Jacksonville beach, and took off on the longest non-stop, non-refueling airplane flight ever made.

Four days and three nights the big plane circled above excited Jacksonville, Florida—traveled over 6000 miles before the reserve of fuel oil ran out. Long enough to break the world's record by more than nine hours!

"We wish to express our appreciation for the part Goodrich Low Pressure Tires and Goodrich oil and fuel line hose played in our flight," write Lees and Brossy. "Our plane weighed approximately 6700 pounds and the tires did not give us the slightest trouble either in taking off or landing. The special hose you made for covering our fuel lines worked out far better than we expected. You may be assured we will call upon you again whenever the occasion demands."

On any plane Goodrich Low Pressure Tires add safety—make take-offs and landings easier. Small wonder that these sturdy tires are the leading choice of airmen everywhere.

The B. F. Goodrich Rubber Company, Established 1870, Akron, Ohio and Los Angeles, California.

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## AERONAUTICAL INDUSTRY

#### DIGEST OF RECENT EVENTS

A Brief Chronological Summary of the Month's Important Aeronautical News

#### Test British Seaplane

(England.) Sir Alan Cobham took off at Rochester, Kent, in the Valetta, a trimotor seventeen-passenger seaplane, on a sixweeks' flight to test the practicability of the plane and to explore a new airline route over the lakes of Central Africa. The ship is especially designed for high-altitude flying. He was accompanied by a crew of five. (July 22)

#### N. A. A. Convention

The Tenth Annual Convention of the National Aeronautic Association was held at Washington, D. C. (July 23-24)

#### National Air Tour

With ten planes competing the National Air Tour for the Ford Reliability Trophy completed at Detroit, Mich., a 4,858-mile flight at speeds averaging from 64 miles per hour to 143 miles per hour. Awarded on a point-score basis, the trophy went to Harry L. Russell, last year's winner, who piloted a trimotor Ford with three Wright engines. James H. Smart with a Wasp-powered Ford was second. L. R. Bayles, in a Granville Bee Gee won the Great Lakes Trophy for light planes. (July 25)

#### King's Cup Race

(England.) Although extremely difficult weather was encountered, twenty pilots out of forty starting completed the annual 982.5-mile King's Cup Air Race around Britain and unusually high speeds were attained by the winners. Flying Officer E. C. T. Edwards, R.A.F., placed first with an average speed of 117.8 miles per hour in a Blackburn "Bluebird" biplane. (July 25)

#### Detroit Balloon Race

Apparently two balloons tied for first place with 220 miles to their credit, in the annual Detroit Balloon Race. Starting from Cleveland with five other entries, Edward J. Hill landed near Marietta, Ohio, and Tracy Southworth finished at Option, Pa. (July 26)

#### Northern Air Route Survey

Parker D. Cramer took off at Detroit, Mich., on a projected flight to Denmark via Canada, Greenland, Iceland and the Faroe Islands, to make an aerial survey of a northern air mail route to Europe. He flew a Diesel-powered Bellanca monoplane equipped with seaplane floats. The flight was sponsored by Trans-American Lines.

#### Lines Corporation. (July 27) Boardman-Polando Flight

Russell N. Boardman and John Polando took off in the Bellanca monoplane Cape Cod at Floyd Bennett Airport on a flight to Istanbul, Turkey. (July 28)

#### Herndon-Pangborn Flight

Eighteen minutes after the Cape Cod started for Turkey, Hugh Herndon, Jr., and Clyde Pangborn left Floyd Bennett Airport on an eastward flight around the world in an attempt to set a new record for the distance. They flew the special Bellanca monoplane Miss Veedol. (July 28)

#### International Soaring Meet

(Germany.) The International Soaring Meet, participated in by more than ten countries, was held at Wasserkuppe. (July 28-August 10)

#### Lindbergh Flight

Colonel Charles A. Lindbergh left North Beach Airport, Queens, N. Y., on a flight to Japan, via Canada, Alaska and Siberia. He was accompanied by Mrs. Lindbergh and flew a Lockheed Sirius monoplane equipped with seaplane floats. (July 29)

#### Graf Visits Arctic

(Germany.) Carrying a party of scientists, the Graf Zeppelin returned to Germany, completing a seven-day cruse to the Arctic for the purpose of exploring the Far North from the air. New lands were discovered and scientific work of three years was accomplished within three days. (July 30)

#### Long-Distance Record

(Turkey.) Boardman and Polando landed at Istanbul on a flight from New York, establishing a new world's long-distance record of 4,986 miles in forty-nine hours and nineteen minutes, exceeding the former record of 4,912.7 miles set by Dieudonne Coste from Paris to Manchuria two years ago. (July 30)

#### Brock-Garrett Tour

(Canada.) Dr. John D. Brock, accompanied in a Stinson Junior by Colonel R. Garrett, landed at Montreal on a good-will tour of the United States and southern Canada, and completing his 613th consecutive day of flying. (July 31)

#### Airworthiness Conference

A conference to discuss proposed changes in the airworthiness requirements for air-craft was held at Washington, D. C., between officials of the Aeronautics Branch, Department of Commerce, and approximately fifty representatives of aeronautical manufacturers. (July 31)

#### National Glider Meet

For the second successive year, Albert E. Hastings won the Edward S. Evans Trophy for the American championship in gliding at the National Gliding and Soaring Con-

test, held at Elmira, N. Y. Among his accomplishments at the meet was a duration flight of seven hours and thirty minutes. (August 2-16)

#### World Flight Abandoned

(Siberia.) Pangborn and Herndon abandoned at Khabarovsk a projected flight around the world to exceed the record of Post and Gatty. Twenty-two hours and fifty-eight minutes behind the Winnie Mae's record, they had flown from New York to Moylegrove, Wales; Croydon Airdrome, London; Templehof Airdrome, Germany; Deitigari, Omsk and Chita, Siberia. Delayed by weather and other extraneous circumstances, they had covered a total distance of 9,200 miles in a total elapsed time of 140 hours and thirty-two minutes, or a flying time of 107 hours and three minutes. After a delay of a few days because of unfavorable weather, they flew on to Tokio. Detained by the authorities, they were charged with flying over forbidden zones and taking photographs and fined \$1,025 each. (August 3)

#### Do.X Starts for U. S.

(Brazil.) The Germany flying boat Do.X took off at Rio de Janeiro on a flight to New York, continuing a flight which started at Altenrhein, Switzerland. The plane was in command of Lieut. C. H. Schildhauer, U. S. N., and carried ten passengers. (August 5)

#### Navy Air Program

Of a total of \$129,385,000 expenditures called for in the navy's building program for the fiscal year 1932, more than \$81,000,000 will be appropriated for the air arm, Secretary Adams announced. (August 5)

#### Hall Sets Record

James Goodwin Hall completed a record round trip flight from New York to Chicago in his Lockheed Altair monoplane. He made the westward flight in four hours and twelve minutes, the eastward flight in four hours and three minutes and the round trip, with one hour and forty-one minutes at the Chicago airport, required nine hours and fifty-six minutes. (August 5)

#### England-Japan Record

(Japan.) Miss Amy Johnson landed at the Tachikawa Airdrome, completing a flight in easy stages from London in ten and one-half days, exceeding the former light plane record of eleven days made by Seiji Yoshihara, Japanese pilot. Mis Johnson was the first woman to make the flight via Siberia. She was accompanied by C. S. Humphries. (August 6)

#### Australia-England Record

(England.) J. A. Mollison landed at Pevensey Bay on a 10,000-mile flight from Australia in eight days, twenty hours and nineteen minutes, bettering by approximately two days the former record of ten days and Box of 100 . . . . . . .

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|   | A 3 3                                                                                           |

twenty-three hours established recently by C. W. Scott. (August 6)

Akron Christened

More than 100,000 attended ceremonies in conjunction with the christening of the navy's new super-dirigible the Akron at the Goodyear-Zeppelin airship dock, Akron, Ohio. The airship, formerly, the ZRS-4, was christened by Mrs. Herbert C. Hoover, (August 8).

Von Gronau to U. S. (Iceland.) Capt. Wolfgang von Gronau, German flier at Revkjavik on a flight from Europe, announced that he would continue on to the United States across the northern route. (August 10)

Cramer Flight

(Denmark.) Hope was abandoned for the American flier, Parker Cramer, and his Canadian radio operator, Oliver Pacquette, missing for several days on a flight from the United States to Copenhagen to make an aerial survey of a great circle air mail route between the United States and Europe. (August 12)

Hawks Sets Record

Shattering the New York to Chicago flight records, Capt. Frank M. Hawks flew from Roosevelt Field, L. I., to the Chicago Municipal Airport in four hours and six minutes, clipping six minutes from the former record set by James G. Hall. He continued to South Springs, S. D., planning to return to New York the following day via Chicago. (August 12)

Captain Hawks

A new record of three hours and fortysix minutes from Chicago to New York was established by Capt. Frank M. Hawks, exceeding by twenty minutes the record held by J. G. Hall. On the flight, which started at Hot Springs, S. D., he flew the distance of 1,546 miles to New York via Chicago in an elapsed time of eight hours and fortyeight minutes. (August 13)

Preston-Collignon Flight

Edwin L. Preston and Robert H. Collignon took off at Detroit, Mich., on a 4,300mile flight to Copenhagen, Denmark over the great circle route on which Parker Cramer and Oliver Pacquette were reported lost on a flight to chart a northern air mail route to Europe. They will search for the others and continue the survey of the route, flying a Stinson Junior monoplane equipped with a Packard Diesel engine and seaplane floats. Their flight is sponsored by Trans-American Air Lines. (August 18)

Do.X at Paramaribo

(Dutch Guiana.) The German flying boat Do.X, en route from Rio de Janeiro to New York on an extended flight from Switzerland, arrived at Paramaribo from Para. remained overnight and took off for Miami. (August 18)

Graf Flies to London
(Engand.) The Graf Zeppelin landed at Hanworth Airdrome, London, on a flight from Germany, discharged twenty-two passengers and then took off within an hour with a new complement of twenty-four passengers on a twenty-four-hour cruise of Britain. This is the first time a Zeppelin has landed in England since the war. (August 18)

Lindhergh

Col. Charles A. Lindbergh (Siberia) and Mrs. Lindbergh left Avatacha Bay, Siberia, on a flight from New York to Tokio, Japan, via Canada, Alaska, Siberia and the Kurile Island chain. It was reported that they planned to continue their westward flight around the world. (August

Von Gronau

(Greenland.) Capt. Wolfgang von Gronau landed at Ivigut from Godthaab on a flight to the United States across the Arctic route. He planned to proceed to Disko Bay and take off on the last lap. (August 19)

Liner-Plane Mail Record

The fastest steamship-airplane mail delivery service ever made across the Atlantic was reported by officers of the North German Lloyd liner Bremen. A plane landed the Bremen's mail at Boston three days, twenty-two hours and fifty-four minutes after the liner left Cherbourg. The plane took off from the steamship 625 miles at sea from Boston and reached the city four hours and fifty minutes later. (August 19)

#### Department of Commerce and Aeronautical Manufacturers Agree to Changes in Airworthiness Requirements

CHANGES in the airworthiness requirements of the Federal Air Commerce Regulations for Aircraft were agreed upon by officials of the Department of Commerce and representatives of approximately fifty aircraft manufacturers at a conference held July 31 at Washington, D. C., between the Aeronautics Branch and the aeronautical industry, The changes, largely of a technical nature and involving more careful attention to design and construction with a view to providing increased safety, were for the most part agreed upon. Other recommendations were taken under advisement after discussion.

A recommendation that the landing speed of seaplanes and flying boats be increased was advanced by the manufacturers. The Department's regulations require that such aircraft "land at a speed not exceeding sixty-five miles per hour except that airplanes which are neither designed nor used to carry passengers shall land at a speed not exceeding seventy miles per hour." The manufacturers suggested that the landing speed for seaplanes be changed to seventy miles per hour on passenger-carrying planes and seventy-five miles on non-passenger.

Among the changes recommended by the Department, an item concerning the provision of emergency exists in planes aroused considerable discussion. The acceptance of the change was deferred to further consideration.

Colonel Clarence M. Young, Assistant Secretary of Commerce for Aeronautics presided at the conference. He explained that the airworthiness requirements constitute a set of rules which serve as a guide to the aircraft industry as to what will be required on new design. There have been a number of changes in aviation engineering during the past year, he pointed out, and the regulations have proven themselves sufficiently flexible to allow for these changes.

#### To Begin Construction of Dirigible Hangar at Sunnyvale, Calif.

THE Navy Department has advertised for bids, to be opened the latter part of September, for the construction of the dirigible hangar at the navy's new lighterthan-air base at Sunnyvale, Calif. Plans and specifications of the structure have been completed by the Bureau of Yards and Docks, Navy Department.

One specification on which bids will be received includes the grading of the site, the foundations of the hangar, and the railroad track from the station boundary to the hangar site. A second specification includes the superstructure and covering of the hangar.

The hangar, which is to serve as a Pacific Coast dirigible base, will be 1,138 feet long, 310 feet wide, and 198 feet high.

In general shape, it will be similar to the Goodyear-Zeppelin Corporation's hangar at Akron, Ohio, and will have the same type of "orange-peel" doors. The main arches, which are spaced seventy-two feet apart. are of a three-hinged type, with the lower pins set fifty-five feet above the floor level and supported on heavy A-frames.

In addition to the hangar, a number of buildings and structures will be required to complete the station, including an administration building, barracks and mess hall, a dispensary, a recreation building, officers' quarters, an aerological and radio station, store-houses and shops.



The Goodyear-Zeppelin airship dock at Akron, Ohio

The Lindberghs' Cyclone-powered Lockheed is equipped with radio . . . protected against ignition interference by Breeze Radio Shielding

> THE latest in radio reception and transmission equipment has enabled Colonel and Mrs. Lindbergh to maintain contact with ships and shore stations at practically all times since they left the United States on their aerial vacation.

Interference from the ignition system is effectively eliminated by the Breeze Radio Shielding which houses the plugs, ignition and magneto cables of their powerful Wright "Cyclone" engine. Protection from wear, tear and breakage, oil soaking, salt water spray, etc., also is provided by this widely used conduit type of shield.

Others prominent in the aviation industry who Use Breeze Radio Shielding are:

Wright

Pratt & Whitney

Lycoming

Ford

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Each Breeze Radio Shield is designed for a particular make of engine. A table of weights for the different engines will be sent promptly to interested parties.

NCREASES in both the average high speed and landing speed of approved type airplanes have occurred during the four years that have elapsed since the Aeronautics Branch of the Department of Commerce began issuing Approved Type Certificates, according to a recent Department announcement. In many cases, the payload has been sacrificed to greater speed.

The average high speed of approved type planes has increased approximately by ten miles per hour from 117 to 127 miles per hour. This was accompanied by an increase in average landing speed from fifty-seven to sixty miles per hour.

The 390 airplanes approved as types during this four-year period were considered in the study and a survey of the sixty-five engines approved during 1928-29-30 was also

It was found also that the use of more powerful engines to achieve greater speed had resulted in a decrease in power loading. Wing loading, on the other hand, increased.

Average payload decreased in proportion to gross weight, and payload became less in proportion to horsepower. It was found, how-

ever, that the larger airplanes were most efficient from the standpoint of payload carried in relation to their size and horsepower.

Landplanes were most numerous among designs submitted for Approved Type Certificates, being more than eighty per cent of the total. Next in order were seaplanes, followed by amphibions and flying boats.

Four years ago, open-cockpit types were most numerous among the models approved, leading cabin types by a large margin. However, toward the end of the period of the survey, cabin types were submitted in increasing numbers, so that open designs amounting to only slightly more than half of the total for the four years.

Biplanes were more numerous than monoplanes among early approvals, but in the latter part of the period monoplane designs exceeded the others.

Among engines, the most approvals were granted to those of the radial air-cooled type. Others approved were in-line air-cooled. Vtype water-cooled and V-type air-cooled, ranking in number of approvals in the order named.

AIRCRAFT OUTPUT AT NORMAL LEVEL IN FIRST HALF OF 1931

DOMESTIC production of commercial and military airplanes in the United States during the first six months of 1931 totaled 1.606, of which 1.069 were for civil use, according to a report recently issued by the Aeronautics Branch of the U.S. Department of Commerce.

The volume of production was slightly less in the first half of 1931 than in the corresponding half of 1930, Between January 1 and June 30, 1930, the number of airplanes produced was 1,684, of which 1,177 were for domestic civil use.

The 1,069 planes built for civil use in this country during the period January 1 to June 30 of this year, included 750 monoplanes, 277 biplanes, forty autogiros and two helicopters. Of the monoplanes, the majority were landplanes of the one-or two-place open-cockpit type, and of the biplanes, the majority were either two-or three-place open-cockpit landplanes. Production of monoplanes increased thirty-three per cent in the first half of 1931 over the first half of 1930, while production of biplanes was fifty-four per cent less in the first half of this year than in the first half of last year.

Of the airplanes produced in the first half of 1931, the total of 1,606 was divided as follows: 1,069 for civil use, 480 for military delivery and fifty-seven, including civil and military, for delivery to purchasers in foreign countries

Records of the Aeronautics Branch show that the 1,069 airplanes manufactured for domestic civil use were built by 197 companies or individuals. Forty-three manufacturers built 786 of these airplanes under ninety-nine Approved Type Certificates.

EIGHT hundred and sixty-seven more passengers were handled by Transcontinental and Western Air during the month of July than in June, an increase of twentysix per cent, while the weight of air mail carried increased thirty-seven per cent, and the express poundage increased fifteen per cent, officials recently announced. Business during August continued along the same upward trend, with all transcontinental and New York-Chicago ships being sold out often two days in advance and the services between New York and Pittsburgh and between Los Angeles and San Francisco being taxed to capacity.

T. & W. A. inaugurated on August 5 a new over-night air freight service between New York and Kansas City. Transcontinental and Western Air is flying 19,312 scheduled miles daily.

#### New Regulations on Air Transport Service Adopted

AMENDMENTS to Federal Air Commerce Regulations governing scheduled operation of interstate passenger air transport services were accepted, subject to certain changes in wording, by the Department of Commerce at a conference held July 28 at Washington, D. C., between the Aeronautics Branch and executives and pilots of scheduled airlines.

In general, the conference agreed that the proposed amendments to the Air Commerce Regulations which were submitted by the Department for the consideration of operators and pilots would further the interests of safety and reliability in air transportation.

Certain portions of the amendments caused considerable discussion, especially on the part of some operators who felt they would add materially to operating expenses. However, it was recognized that in the final analysis the amendments, with minor alterations,

could be adopted to the benefit of both the public and the industry.

A proposed certificate of competency for airline pilots providing certain qualifications for eligibility to employment in interstate passenger air transport service met with criticism from operators, who asserted that flying time was not necessarily a criterion of competence. It was decided to redraw the certificate to incorporate certain suggested changes after which it again will be submitted to the industry.

REPORT OF AIRCRAFT PRO TION FROM JANUARY 1 TO JUNE 30, 1931 PRODUC-

(Based on Department of Commerce Li-censes, Identification Marks Issued for Unlicensed Aircraft, and Reports)

#### Monoplanes

Oben-Cockbit (landblane)

| wo-place<br>hree-place<br>our-place                                | 356<br>10(a<br>2 | a)  |  |  |  |
|--------------------------------------------------------------------|------------------|-----|--|--|--|
| Total open                                                         | 544              |     |  |  |  |
| Cabin (landplane)                                                  |                  |     |  |  |  |
| One-place                                                          | 2                |     |  |  |  |
| hree-place                                                         | 23               |     |  |  |  |
| our-place                                                          | 78               |     |  |  |  |
| ive-place                                                          | 3(1              | 0)  |  |  |  |
| ix-placeeven-to ten-place                                          | 8<br>22(e        | - \ |  |  |  |
| Over ten-place                                                     | 44(              | i)  |  |  |  |
| Total cabin                                                        | 187              | _   |  |  |  |
| Aiscellaneous                                                      |                  |     |  |  |  |
| onvertibles                                                        | 5<br>11(e        | e)  |  |  |  |
| fonoplanes for which data as to place, etc., not availableeaplanes | 1(t              | )   |  |  |  |
| Total monoplanes                                                   | 750              | _   |  |  |  |
| Biplanes                                                           |                  |     |  |  |  |
| pen-Cockpit (landplane)                                            |                  |     |  |  |  |
| ne-place                                                           | 18               |     |  |  |  |
| wo-place<br>hree-place                                             | 97<br>126        |     |  |  |  |
| our-and five-place                                                 | 14               |     |  |  |  |
| Total open                                                         | 255              |     |  |  |  |
| abin (landplane)                                                   |                  |     |  |  |  |
| our-to seven-place                                                 | 15               |     |  |  |  |

Note: (a) 2 multi-engine planes; (b) 1 multi-engine plane; (c) 11 multi-engine planes; (d) 36 multi-engine planes; (e) 4 multi-engine planes; (f) does not include planes listed in the above breakdown or planes exported in 1931 which were manufactured prior to January 1, 1931.

Total cabin .....

Total biplanes ...... 277

Amphibions .....

Seaplanes .....

Autogiros ....

Helicopters Military airplane deliveries.....

Airplanes exported (f).....

Miscellaneous

Helicopters

## The MARSHALL Flying School

(INCORPORATED AND ESTABLISHED 1923)

## IMPROVED COURSES, LOW RATES

#### SPECIAL 10-HOUR FLYING COURSE

Including 7 weeks' mechanic's course and \$150 solo flight if student is capable...... \$120

10 hours of flight instruction, including solo flights if capable.....

200 hours of dual, check and solo advanced flight instruc-

tion; complete 12 weeks' mechanic's course with special advanced instruction in meteorology, navigation and map reading.....

TRANSPORT COURSE

#### PRIMARY AVIATION COURSE

20 hours' flight instruction and 7 weeks' mechanic's course with solo time as capable

#### DEPARTMENT OF COMMERCE—PRIVATE PILOT'S—SPORTSMAN'S COURSE

25 hours-necessary dual and solo flight instruction to qualify for Department of Commerce Private Pilot's license, 7 weeks' mechanic's course.

#### 50-HOUR FLYING COURSE

with instruction in advanced flying, solo as capable and complete 12 weeks' mechanic's course........

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#### DEPARTMENT OF COMMERCE-LIMITED COMMERCIAL PROFESSIONAL COURSE

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#### SOLO FLYING

A special inducement to students completing courses: Unlimited solo time on new production planes with air cooled motors, per

#### MECHANIC'S COURSE

375 hours' scientifically arranged instruction, lectures and practical work on modern radial, air cooled and water cooled engines and 52 pertinent subjects, qualifying students for Dept. of Commerce engine mechanic's and airplane mechanic's licenses, upon student passing Air Commerce Regulations re-\$60 quirements....

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100 hours' light and heavy metals, fabrication, cutting, steel, aluminum and alloys, with complete mechanic's course, including electric welding.....

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#### Aeronautic Sessions at A. S. M. E. Regional Meeting, Kansas City

A T the Regional Meeting of the American Society of Mechanical Engineers scheduled at Kansas City, Mo., September 7-9, several papers will be presented at the aeronautical session.

The papers are as follows: "Development of Practical Light Airplanes," by K. H. White, Curtiss-Wright Airplane Company, Robertson, Mo.; "Aircraft Diesel Engines," by H. C. Edwards, Packard Motor Company, Detroit, Mich.; "Trend in Airplane Design," by William B. Stout, Stout Engineering Laboratories, Dearborn, Mich.; "Aviation Insurance," by J. B. Guinotte, Barber and Baldwin, Inc., Kansas City, Mo.; The Maintenance and Overhaul of Aircraft and Engines," by H. L. Bredouw, Bredoww-Hilliard Aeromotive Corporation, Kansas City, Mo.; and "Airplane Landing Gears," by Frederick Knack, Aerotech, Moline, Ill.

#### Buys Group Life Insurance for Employees

THE Aviation Corporation of Delaware has contracted with the Aetna Life Insurance Company of Hartford, Connecticut, for a group life insurance policy covering 1,500 of its employees, the total amount of the insurance being in excess of \$3,600,000, the Aviation Corporation recently reported.

The insurance is on a contributory basis whereby employees and the corporation share in the cost. It is available to all employees without medical examination, in amounts ranging from \$2,000 to \$10,000, depending upon their monthly earnings. In addition to the life insurance the policy provides for total and permanent disability benefits.

The Aviation Corporation has also purchased a special accident insurance policy covering pilots and co-pilots.

### LAMBERT-ST. LOUIS AIRPORT (Continued from page 70)

(Consisted from page 70)

logical approach to the southeast-northwest runway. This particular runway area is over 5,000 feet in length.

Extensive meteorology and weather reports from the Department of Commerce radio stations all over the United States are furnished the United States Weather Bureau on the field both day and night.

A traffic operator, stationed at the point of take-off, controls the taking-off and landing of all planes on the field. An incoming plane has the right of way while outgoing planes are held on the ground by a red flag and are released by a black and white checkered flag. On arrival visitors are requested to register and not take off except through the traffic operator.

Five airlines are located at the airport. The airlines include a transcontinental service from New York to Los Angeles; a service to Chicago with three arrivals and three departures daily, and daily services to Memphis, New Orleans, Kansas City and Omaha.

Airlines which operate off the Lam-

#### COMING AERONAUTICAL EVENTS

August 29. Dedication of Municipal Airport, New Haven, Conn.

August 29-September 7. National Air Races, Cleveland Airport, Cleveland, Ohio.

September 1-3. Twentieth National Aeronautic Meeting of S. A. E., Hotel Statler, Cleveland, Ohio.

September 5-13. First Annual Air Fair, Binghamton Airport, Binghamton, N. Y.

September 7. International Gordon Bennett Balloon Race, Cleveland, Ohio.

September 7. Thompson Trophy Race in conjunction with the National Air Races, Cleveland, Ohio.

September 7-9. Regional Meeting of the A.S.M.E., Kansas City Athletic Club, Kansas City, Mo. September 11-13. Third Annual

September 11-13. Third Annual Sioux Falls Air Races, Sioux Falls, S. D. September 12-13. Fiesta of the Air,

Los Angeles Municipal Airport, Los Angeles, Calif., in conjunction with La Fiesta de Los Angeles.

September 12. Schneider Trophy

hert-St Louis Municipal Airport are

bert-St. Louis Municipal Airport are: Universal Division of American Airways, Inc.; Interstate Division of American Airways, Inc.; Transcontinental and Western Air, Inc.; Robertson Air Lines, and Rapid Air Transport, Inc.

#### Announce Tests for Assistant Radio Operator on Airways

THE United States Civil Service Commission announces an open competitive examination for assistant radio operator (airways). Application for the position must be on file with the U. S. Civil Service Commission at Washington, D. C., not later than September 18, 1931. The examination is to fill vacancies in the Bureau of Lighthouses, Department of Commerce.

Competitors will not be required to report for examination at any place, but will be rated on their training, experience and fitness. Applicants must have had at least four years' experience as commercial radio operator on board ship or at a wireless station, or as radio operator on board a ship of the United States Navy, Coast Guard, or other Government vessel, or at a Government wireless station. At least six months of this experience must have been acquired within the last two years.

J. N. Kelly to Manage Bennett Airport CAPTAIN J. Nelson Kelly has been appointed manager of Floyd Bennett Airport, Barren Island, N. Y., by Major James J. Walker of New York City. Mr. Kelly was formerly manager of Roosevelt Field, L. I., where he will be succeeded by Walter L. Avery, as assistant manager.

Floyd Bennett Airport was recently made

Race, Southampton, England.

September 12-13. Air meet, auspices American Legion and the Aero Club of Pennsylvania, Municipal Airport, Philadelphia, Pa.

September 25-27. Dedication of the Municipal Airport, Indianapolis, Ind.

October. International air mail conference, Brussels, Belgium.

October 5-10. National Congress of Colonial Aviation in conjunction with the International Colonial Exposition, Paris, France.

position, Paris, France. October 5-15. Tour of aeronautical and other industrial laboratories, auspices National Research Council. October 7-8. Production Meeting of the S. A. E., Book-Cadillac Hotel,

Detroit, Mich. October 8-11. First Annual All-Southern Aircraft Pageant, Char-

lotte, N. C. October 22-November 5. Glider Contest, auspices Honolulu Chapter of

the N. A. A., Honolulu, Hawaii.
October 27-29. Fall transportation meeting of S. A. E., Washington, D. C.

available for night landings following a successful test of the field's lighting system installed by the Sperry Gyroscope Company.

#### NORTHEAST

#### Successful Operations Reported by Maine Air Transport Company

PROFITS of seven per cent on outstanding stock have been earned by the Maine Air Transport Company, Rockland, Me., according to a report of operations recently issued by W. H. Wincapaw, president. In five weeks of operation over a small route which is flown three times daily on schedule and on special trips as required, a total of 1,036 passengers has been carried. total flying time on each round trip is approximately thirty-five minutes. On one occasion, a total of 168 passengers was carried between Vinalhaven and Rockland, the company's record for a single day. Special trips are also made among the islands in the vicinity of Rockland, particularly as an "ambulance" plane to transport ill persons. These flights are given preference to scheduled trips.

The company operates a six-place cabin Travel Air powered with a Wright Whirlwind 300 and equipped with Edo floats.

THE Loening amphibion which Curtiss-Wright operated from Bar Harbor for a few weeks has been sold to Kohler Airways of Milwaukee. The Robin on pontoons is doing a good business at Bar Harbor and will remain there throughout the season. Pilot Treat continues to report a profit with the Ireland at Moosehead Lake. Lou Levy is operating from Augusta Airport with a six place Travel Air from this base. The Ireland which was stationed on Sebago Lake has returned to Rockland.

DEDICATION of the Rhode Island State Airport at Hillsgrove is scheduled September 26.

Wings, Inc., of Providence, and E. W. Wiggins & Company, Inc., operators of the Leominster-Fitchburg Alriport, have formally taken control of all commercial aviation activities at the Hillsgrove field, in accordance with leases granted by the state.

Mr. Wiggins announced that for the present his firm would confine its activities to student instruction and passenger flying.

The rules of the Boston Municipal Airport regarding commercial traffic have been adopted for the Rhode Island State Airport by the State Airport Commission.

THE opening of Brentwood Airport, four miles northeast of Bay Shore, L. I., N. Y., was recently announced by Major William L. Purcell, president of the Bradford Aero Sales Corporation. Student flight training, including Franklin gliding practice, passenger hops and cross-country trips, will be made available.

FOR THE third time in succession, E. B. Meyrowitz, Ltd., London, has been awarded the contract by the Air Ministry to supply England's Schneider Race team with Luxor goggles, according to a recent announcement of G. A. Sholz, of the company's New York office.

The goggles selected for this year's team is the Luxor No. 6, with flat sorbo cushions. The lenses are to be the large, curved safety glass lenses which are made only by the Acetex Company in England. Each member of the team will be supplied with another pair of goggles fitted with the same lenses in Crookes' B tint, to be used while training.

EIGHTEEN officers of the 1931 graduating class of the Army Air Corps Engineering School at Wright Field, Dayton, Ohio, under the leadership of Capt. Grandison Gardner, recently made an inspection of the plant of the Wright Aeronautical Corporation, Paterson, N. J.

#### Record Set at Newark Airport

NEWARK AIRPORT carried a total of 10,052 passengers on scheduled lines during July for a world's record, it was reported recently. The former mark of 9,400 passengers was made in June. Mail carried in July totaled 170,868 pounds, slightly less than the June mark.

FLIGHT exhibitions are being made daily at Atlantic City, N. J., in the Kellett Autogiro Miss Steel Pier, according to a recent announcement of officials of the Kellett Aircraft Corporation, Philadelphia, Pa. This craft represents the first sale of a Kellett autogiro by the Atlantic Giro Aviation Corporation, Which has been appointed a Kel-poration, which has been appointed a Kel-

lett distributor in the Atlantic City area. The company operates at the Atlantic City Airport.

THE Ludington Line during July carried 9,119 passengers between New York and Washington, and Camden and Atlantic City, the company recently announced.

GEORGE KOLB, formerly with Pitcairn Aviation, is now connected with the Wings Corporation. The Wings company, Waco and Stinson distributors, operates from Wings Port, near Ambler, Pa.

THE Pitcairn PAA-1 sport autogiro was recently awarded an Approved Type Certificate by the Department of Commerce. The PAA-1 is manufactured by Pitcairn Aircraft, Inc.

THE Wings Corporation recently took delivery on a Kellett autogiro. The ship will be used as a demonstrator by the corporation, which has added the distributorship of the Kellett machine to its other lines.

#### Plan Buhl Autogiro

REPRESENTATIVES of the Buhl Aircraft Company, which has been licensed through the Autogiro Company of America to manufacture autogiros, recently conferred with engineers of the Autogiro Company on the design of the forthcoming Buhl Autoerin.

As a result of the conference, a unique pusher type of design was selected. The designing of the new ship is proceeding rapidly and the craft will be put into production, according to present plans.

FORTY-THREE students are taking glider instruction at Wings Port under the

tutelage of Lewin Barringer, instructor at the field. Training is given in Waco gliders.

PENN SCHOOL OF AVIATION recently took delivery on its second Buhl 'Bull Pup," to be used for solo instruction and rented on an hourly basis to graduates of the school. The Department of Commerce has sanctioned the inclusion of the Bull Pup time in the approved limited commercial and transport courses offered by the school.

#### Kellett Autogiro Receives A. T. C.

The Kellett Aircraft Corporation of Philadelphia, Pa., has announced the issuance by the Department of Commerce of Approved Type Certificate 437 for the K2-2 Autogiro.

The Kellett autogiro as now being delivered by the factory is showing from eight to ten miles per hour more speed than the ships demonstrated earlier in the year, because of improvements in streamlining.

### Develop New Cartridge-Type of Starter for Aviation Engines

A NEW cartridge-type of starter for aviation engines, designed to increase safety in flight, improve economy of operation and facilitate starting and re-starting while in flight, was announced recently by Harry A. Kraeling, president of the Standard Aero Starter Company of Pittsburgh, Pa. The cartridge, which is ignited by an ordinary flashlight cell, releases a gas which passes through a tube to an expansion chamber mounted on the rear of the engine. In this chamber the gas builds up sufficient pressure to operate a self-contained starting mechanism. When the crankshaft starts turning, the starter develops forty-five horsepower.

#### GLIDERS TOWED IN "VEE" FORMATION

A "VEE" formation of three Franklin gliders was successfully towed recently at the airport of the D. W. Flying Service, Inc., LeRoy, N. Y., by a Kinner-powered Fleet. The plane was equipped with a release apparatus having a manually operatelease cord located in the pilot's cockpit and releasing all three towing cords simultaneously.

The towing cords were made up of 7 x 19 strand tinned aircraft cord, rings being placed at each end. The two outside cords were made up 500 feet long. The center cord was 465 feet long, a difference of thirty-five feet allowing the center glider's tail surfaces to lead outer glider wings about five feet.

It was at first thought that the two outer gliders could not keep apart, because the cords were attached to the same point at the forward end. To determine this possibility, before placing the third glider in the center, the two outer gliders were towed. The gliders, due to the smaller angle of the "wee" at the forward end and the length of rope, had only a slight tendency to come together; a slight amount of rudder, and lowering of outer wings would clip gliders outwardly from center line so far that it was evident that the center slider would not

be in the way. On the two-glider flight, the pilots brought their ships as close as ten feet apart and the two gliders were flown one directly above the other to prove controllability.

The next procedure was to add the third glider, making the "vee" complete. The cables were laid out, gliders attached, cables attached to the Fleet at the forward end, and signals were arranged for the take-off and for maneuvering the ships in formation after the release.

The take-off was accomplished by getting the leading glider into the air first, then the outside gliders hopping off and all three diving a little to permit the tow ship to get in the air. After twenty-five minutes of flying, 2,500 feet was reached, where the left outside pilot gave the signals to release. After the releasing, the gliders executed several formations.

The gliders were flown by W. Hawley Bowlus, instructor of the glider division of the D. W. Flying Service; Russell Holderman, president of the D. W. Flying Service; and Warren A. Eaton, who holds the American altitude record for gliders. The tow ship was piloted by "Vic" Evans, chief instructor of the D. W. Flying Service.

The sponsors claim that this apparatus is the lightest piece of machinery in the world for the horsepower developed—less than one-half pound per horsepower.

THE Aerogenius Company, Inc., Baltimore, Md., has been organized. The company plans to engage in the general rebuilding of airplanes. The organizers are David A. Dannenfelser, Jr., Howard G. Bullinger, William L. Bond, F. Joseph Pawlik and Frederick W. Kacher.

THE Robey-Lambert Airplane Company, of Riverdale, Md., has changed its name to The Robey-Lambert Diesel Engine Company. The concern is capitalized at \$50,000, its authorized capital stock consisting of 50,000 shares of common stock, having a par value of \$1. The company will engage in the manufacture of airplanes. The incorporators are Albert Gustav Baer, Charles Albert Adami and Albert Samuel Roebuck.

THOMPSON PRODUCTS, INC., Cleveland, Ohio, has reported orders from the Fiat Motor Company of Milan, Italy, to manufacture 200 special copper cooled valves for use in the twenty-four cylinder engine of an Italian Schneider Cup racing plane.

A NEW permanent covered walk is being constructed at Port Columbus, Ohio, to replace the old temporary movable canvas canopy. The location is being moved from the east end of the administration building to the center door. Passengers will walk to and from the ships under cover.

AN AMPHIBION with a construction of stainless steel will be built by the Dayton Airplane Engine Company, Dayton, Ohio, in conjunction with the E. G. Budd Manufacturing Company, it has been announced by officials of the Dayton concern.

THE Truscon Steel Company, manufacturers of airport equipment, Youngstown, Ohio, report for the second quarter a net profit of \$61,403.

MORE THAN 10,000 persons recently attended the formal dedication of Port Bucyrus, operated by Miss Lauretta Schimmoler at Bucyrus, Ohio. A twenty-five mile race, a fifteen-mile free-for-all, dead stick landing and balloon bursting contests and exhibition flights were included on the program.

LIEUT. FRANK McKEE, Ohio State Director of Aeronautics, in cooperation with the state highway department has completed plans for air-marking the state's principal highways bordering sky lanes for aircraft. Signs will direct pilots to cities and intermediate points where adequate airport facilities may be found.

AN AVIATION ground school course of twenty weeks has been opened in the Central High School, Columbus, Ohio, by the American Institute of Mechanics. H. G. MAYES of Chesapeake, Ohio, recently took delivery on a Taylor "Gub" equipped with the Continental A40 engine. From the Taylor factory at Bradford, Pa, to Huntington Airport at Chesapeake, he covered approximately 400 miles, receiving a gasoline mileage of 22.5 miles per gallon, using one quart of oil for the trip, according to the Continental Company.

FOUR YEARS of flying has been practically completed by one of three Waco planes with which the Embry-Riddle Company of Cincinnati, Ohio, began the transportation of air mail in 1927. The plane has flown approximately 324,000 miles on the Cincinnati-Indianapolis-Chicago air mail route. Its official time in the air totals 3,000 hours.

A NEW municipal airport is being constructed at Frederick, Md. Considerable progress has been made and it is expected the field will be ready for operation in August.

#### Planes Bring Lake Erie Catches

PILOTS Will Hartmann and Norman Ottenweiler of the Butler-Alameda Airport, fying an Eaglerock biplane and a Curtiss Robin, both ships OX-5 powered, deliver more than 700 pounds of Lake Erie fish every Friday morning to a waiting truck at Curtiss-Bettis Airport, which carries it to the downtown stores of the Donahoe Company in time for the morning sales. Three hours after the catch has been taken from the lake it is on sale downtown in Pittsburgh.





(Top) Sperry "Artificial Horizon" and (bottom) Sperry directional gyro, used on recent successful distance flights

#### SOUTHEAST

#### Southern Air Pageant

THE First Annual All-Southern Aircraft Pageant will be held at Charlotte, N. C., October 8-11, according to a recent amouncement of L. J. Sauerborn, general manager. Aeronautical equipment will be exhibited and an air show will be staged. Speed racing is to be minimized. A number of novelty events intended to entertain spectators and demonstrate the performance of standard aircraft will be included on the program.

THE City of Anderson, S. C., has formally taken over the aviation field at the County Home from the Government.

The city's plans for the improvement of the field call for an area large enough for the landing of any type of airplane. The Government will turn over \$50,000 worth of equipment to the city for the field.

GRADING on the new city airport to be developed three miles south of Newman, Ga., will be completed in the near future. This is one of several emergency stations to be erected on the Government's air mail route between Atlanta and New Orleans. Others will be erected at Opelika and Montgomery, Ala., and two more between Montgomery and New Orleans.

McKENZIE FIELD near Montesuma, Ga., was dedicated recently. It is planned to make this a permanent field on the contemplated line between Atlanta and Tampa.

WITHIN ninety days two important buildings costing \$125,000 for Candler Field, Atlanta, Ga., will be completed. This was assured when the county voted to pay part of the cost.

One of the structures will be a \$50,000 administrative and terminal building, and the other, a \$75,000 hangar and shop building for American Airways Inc. Plans of the latter structure were contingent on the city erecting the administrative building which will be paid for by the city and county.

EASTERN Air Transport Inc., announced in August the completion of a modern stucco and steel aircraft plant and passenger depot at Candler Field here.

The building houses the passenger and air mail planes, motor and plane overhaul departments, pilots' sleeping quarters, ticket and executive offices and passenger waiting room. The main hangar, with a capacity of fourteen mail and passenger planes, occupies 14,000 square feet of floor space. The motor overhaul shop occupies a floor space of 1,750 square feet.

LANDING facilities for both seaplanes and landplanes are provided in the architect's plans for a \$2,000,000 racing plant which the Miami Beach Jockey Club will build on an island in Biscayne Bay, between Miami and Miami Beach, according to an announcement of J. M. Smoot, president of the club. It is intended to provide air transport service directly to the track during the races.

The club has not made provisions to handle the air service itself and plans to cooperate with one of the aviation companies in the Miami area in the establishment of this service, offering in return an exclusive franchise and the facilities of its landing areas.

THE Miami Aero Club has organized a girl's squadron.

A special rate of \$40 for ten lessons has been arranged for a preliminary course.

#### Tampa Summer Air Meet

TAMPA'S second annual summer air meet was scheduled to be held August 27. Plans were announced by Capt. A. McMullen, president of the Tampa Chapter of the National Aeronautical Association.

Capt. McMullen announced that a Buhl "Pup" and money prizes will be awarded to winners of various contests, the plane as first prize. Competitions include a bombing contest, spot parachute jump and special races for planes equipped with OX-5 engines.

Races will be open to planes up to fifty horsepower, from fifty to 110 and from 110 to 225 horsepower. A free-for-all event was also scheduled.

R. V. WATERS, president of the Greater Miami Airport Association, has announced that Col. E. H. R. Green will donate a \$5,000 "Star Island Trophy" aviation cup, to be awarded at the Miami All-American Air Races of 1932.

The pilot who wins the Star Island Trophy, an annual award, will receive a miniature of the cup as a permanent prize.

THE Raymond Aircraft Corporation at the Elder-Haldeman Airport, Lakeland, Fla., have renewed their former rate of one cent a pound for short-haul passengers.

THE McMullen Aircraft Corporation, Tampa, Fla., recently reported more airplanes sold in the first six months of 1931 by the company than in the entire year of 1930.

MORE THAN fifty visiting airplanes were at the municipal Airport, Jacksonville, Fla, during July, exclusive of mail or regular passenger planes. This is a one hundred per cent increase over the same month last year.

ROOSEVELT Aerial Advertising Company, West Palm Beach, Fla., was recently incorporated by A. J. Williams, C. S. Collar and P. W. Potter, directors.

PAN AMERICAN Airways, Inc., during the first quarter of 1931, carried 6,538 passengers into and out of Miami, Arthur E. Curtiss, traffic representative, has announced. This traffic represented roughly one-half of the 13,000 passengers transported on all Pan American routes during that period.

SEBRING Flyers, Inc., Sebring, Fla., was recently incorporated by J. M. Stephenson, W. S. Stephenson and C. S. Babcock, directors. The company will operate a flying school.

#### NORTH CENTRAL

MAJOR Charles E. Cox, Jr., superintendent of flying at the Indianapolis Municipal Airport, Ind., has been appointed managing director of the formal dedication of of the port scheduled September 25-27. The appointment was made by the executive committee of the chamber of commerce dedicatory organization, composed of 200 Indianapolis business men.

Preliminary plans have been made to award more than \$2,000 in prizes for races and contests to be held in conjunction with the dedication.

#### Michigan Plane Tax Law in Effect September 18

THE Michigan law enacted this year requiring airplanes to be licensed and pay a weight tax similar to that imposed on automobiles will not become effective until September 18, according to an opinion of Attorney General Paul W. Vorhies given the Secretary of State, Frank D. Fitzgerald.

The statute was not made immediately effective by the Legislature but contained a provision that it become effective on August 1. The Attorney General ruled, low-ever, that since the Legislature did not make the law immediately effective, it does not go into operation until ninety days after final adjournment of the Legislature, despite the provision for the effective date in the statute.

#### Detroit Aircraft Sales

WITH the sale of three metal seven-place Lockheed Vega monoplanes to New York & Western Airlines, Inc., to augment the Lockheed fleet now operated by that airline between New York and Pittsburgh, Detroit Aircraft Corporation's net sales totaled \$150,753.90 for the five-week period ended August 14, officials reported. Sales included nine Lockheeds, two Ryans, and an Eastman Flying Yacht, in addition to service and parts business closed during the period.

#### Stinson Aircraft Sales

THE Stinson Aircraft Corporation, Wayne, Mich., delivered \$979,000 worth of planes in the first five months of 1931, W. A. Mara, vice president, recently announced. This is a seventy per cent increase for the company over the corresponding period last year.

THE Ex-Cell-O Aircraft & Tool Corporation of Detroit, Mich., has announced the appointment of Erskine & Rosche Company, Minneapolis, Minn., as a manufacturer's representative handling the complete line of products manufactured by Ex-Cell-O.

THE Aircraft Sales & Service Corp., Milwaukee, Wis., has sold a Stinson Jr., equipped with floats, to a group of business men of Hayward, Wis. The ship will be piloted by William Leithold and put into passenger service for short trips and charter work, with headquarters at Hayward.

ARTICLES of incorporation have been filed by the Kenosha Aviation Corporation of Kenosha, Wis. The company has been authorized to issue 200 shares of stock at \$225 each. Incorporators are J. S. Whyte, M. Isermann and D. O. Head.

THE Des Moines Register and Tribuse has announced the purchase of a Pitcairn autogiro for use in gathering news and pictures. This is reported to be the first autogiro to be owned or demonstrated in Iowa. It will be placed on exhibition during the Iowa State fair, August 28 to September 4, and two flights daily will be made.

The ship will be named Good News III.
The present Register and Tribune Stinson eight-place cabin plane, Good News II, will be retained and used for news gathering.

Since the purchase of *Good News I* in 1928 the newspaper's planes have flown more than 135,000 miles, carrying more than 6,000 passengers without an accident.

THREE additional Keystone Loening amphibions have been purchased by the Kohler Aviation Corporation, operating over Lake Michigan to Grand Rapids and Detroit. The new ships increased the firm's fleet to five.

MIDWEST AIRWAYS, INC, Milwaukee, Wis., has inaugurated the Midwest Fly It Yourself System. The concern will rent out planes at ten cents per mile, including gas and oil, to any person holding a Government license. Buhl Bull Pup planes will be used. Larger ships with pilots if desired, will be rented at a higher rate on a mileage basis. The downtown sales offices of the company is being moved to the Milwaukee County Airport.

#### SOUTH CENTRAL

THE Inland Aviation Corporation of Fairfax Airport, Kansas City, Mo., has received patents on the improved type of aluminum air wheel drum developed by Milton Bauman, chief engineer of the company.

STUDENTS in the aviation mechanics' course at the Lathrop Trade School in Kansas City, Mo, have completed a monoplane under the direction of Joseph A. Sadler, which has been given successful test flights by Charles Toth of the Tuxhorn Flying School. The ship is powered with a converted Henderson motorcycle engine.

E. E. PORTERFIELD, JR., recently resigned as director of sales for the American Eagle-Lincoln Aircraft Company, Kansas City, Kan, J. S. Chick, with the former American Eagle Company for a period of three years has been appointed director of sales for the new company to succeed Mr. Porterfield.

THE Von Hoffmann Aircraft Company has opened a soda fountain, lounging room and roof garden in connection with its service hangars at Lambert-St. Louis Field. The new quarters cost \$15,000.

THE Thirty-fifth Division Air Service, Missouri National Guard, departed for the annual encampment at Fort Riley, Kan, July 26. The outfit, recruited up to full strength, is under the leadership of Major Phil Love.

ENTENSIVE plans are being made by the Oklahoma City Chamber of Commerce for the aircraft exhibit to be held in connection with the Oklahoma State Fair next October, according to H. C. Martin, chairman of the committee in charge. An air show will be included.

AVERAGE weekly air mail handled through Oklahoma City for July was 1,079 pounds, according to Harold Halsell, chairman of the air mail club. Average weekly outbound mail was 516 pounds and inbound was 564

INSTALLATION of an air beacon on top of the First National Bank and Trust building, thirty-three stories high, in Oklahoma City, Okla., has been completed. It will not be lighted until the completion of the bank's interior #bout October 1. A temperary stationary light will be installed until the flasher beacon is turned on.

#### Oklahoma's New Aircraft Licensing Rules in Effect

THERE were 101 airplanes grounded under the State of Oklahoma's new aircraft licensing law, effective on August 15, according to figures compiled by W. E. Fletcher, airport manager of the Oklahoma City, Okla., municipal port. The 101 planes unable to comply with the state standards are those which the United States Department of Commerce will not license as of July 1.

The 245 Federally licensed airplanes in the state are valued at more than \$4,750,000, according to Mr. Fletcher. The July figures on which his survey is based credit the state with a total of 346 airplanes and twelve gliders. To fly these planes, 409 pilots are listed. Transport pilot licenses total 208: private, 156: limited commercial, forty-two, and industrial, three. No licensed glider pilots are recorded.

Without funds to enforce the new Oklahoma aviation laws passed by the thirteenth legislature, the work of enforcement has been placed on the state highway department, which in turn has formulated plans for making all state airport managers special officers for enforcement.

Included in the list of enforcement officers for the new aviation laws are all Federally licensed pilots, who will act in reporting any deviation from the state licensing of craft and pilots. Definite plans have been made by E. McDonald, secretary of the state highway department, and W. C. Lewis, assistant state attorney general, to coöperate closely with the Department of Commerce in the enforcement of stringent state regulations. PILOT Frank Hover of the Braniff Air ways has claimed a record for commercial flights after completing a 110-mile trip from Oklahoma City to Tulsa in thirty-two minutes. It is estimated that he averaged 206 miles per hour, carrying four passengers.

A RECENT survey made by students of the Guggenheim School of Aeronautics shows that approximately ten per cent of Tulsa's traveling business men prefer air transportation and use it regularly; and between thirty and thirty-five per cent use planes occasionally. Five hundred business men and firms were interviewed in the survey. Of this number, 200 are frequent users of air mail service; another 200 use it regularly but to a lesser degree, and only twenty of the number interviewed do not use air mail at all.

Fifty-eight companies are using air express and one Tulsa mercantile company brings expensive women's apparel into the city by plane.

WORK has started on the construction of a 4,000,000-candlepower beacon light on the the top of Timbered Hill, near Turner Falls, Okla. A thirty-six-inch lens will be mounted on a seventy-five-foot tower. The hill is the highest point in the Arbuckle Mountains,

TO PROMOTE interest in air mail, air express and air passenger travel, more than forty Oklahoma cities were visited recently by J. R. Green, Oklahoma traffic manager for United Airlines. In each city hotel clerks were appointed representatives of the air transport company. It is expected materially to increase the volume of business to and from Oklahoma City, giving residents of smaller towns air travel information generally.

HOUSTON has been made the Southwest distributing point for Buhl Aircraft Company, which will maintain a warehouse stock of planes to serve distributors and dealers in Texas, Oklahoma, Arkansas and Louisiana.

THE Southwest Air Service of Houston

half of Texas and has ordered eight Buhl Bull Pup planes to be delivered immediately and eight more to be delivered in the near future.

#### Building at Randolph Field Nearing Completion

WTTH regular operations scheduled to begin at Randolph Field, Texas, about November 1, construction at the field, which will be the headquarters of the Air Corps Training Center, is approximately 90 per cent complete, according to a progress chart maintained in the office of Capt. A. W. Parker, construction quartermaster.

Another chart reveals that of the 298 buildings placed under contract, 118 have been completed and accepted by the Government and that most of the other structures are nearly completed.

Equipment is being installed and preparations are being made for the arrival of other property to be used in the maintenance of planes when the field begins operations.

THE Jim Davis Flying Service of Houston, Texas, has been incorporated with a capital stock of \$1,000. Incorporators are James C. Davis, Ina Wade and D. R. Bullard.

THE city council of Fort Worth, Texas, has called a \$100,000 bond election, the funds to be used for improvements at Meacham Field.

#### Wharton Airport Dedication

DEDICATION of the Wharton Airport, Wharton, Texas, is scheduled September 5-6.

The 50-foot-by-64-foot steel and galvarized iron hangar on the Wharton Airport has been completed and an electrically operated gasoline pit is being installed. The landing area is sod, affording an all weather field. A wide shell apron will be provided, as well as parking space for automobiles.

G. C. Gifford, resident of Wharton and owner of the Gifford Flying Services of Beaumont Texas, is owner and operator of the airport.

#### THE LITTLE ROCK MUNICIPAL AIRPORT

WW ORK is progressing rapidly on the the development of the Little Rock, Ark., Municipal Airport for which a bond issue of \$200,000 was voted a year ago. An eighty-acre addition east of the field has been graded, rolled and a drainage system installed. The city will purchase a sixty-acre extension south of the port. This will bring the total airport property to about 300 acres, 250 acres of which will be available for landings and take-offs.

The city obtained a lease from the Government on the old Little Rock Intermediate Air Depot, built during the war, at an investment of approximately \$1,000,000. Hangars, warehouses, quarters and administration buildings had been installed there. The Government abandoned the depot and practically all military equipment and supplies, with the exception of a large number of whippet

tanks, have been removed. The field is five minutes from the midtown business section of Little Rock.

One hangar, headquarters space and a section of the field is reserved for the 154th Observation Squadron, Arkansas National Guard; another hangar is used by commercial pilots and three flying schools operating on the airport. The city plans to erect a new and larger hangar as soon as extension of the field has been completed. A lighting system is included in the development program.

The old officers' club building of the Intermediate Air Depot has been remodeled into a terminal building.

The former residence of the commanding officer of the depot has become the airport administration building, on top of which a glassed-in observation tower has been constructed. THREE 1,600-foot shell runways will be constructed at the municipal airport, Houston, Texas, at a cost of about \$21,000. Construction will begin immediately in order that the job may be completed before the fall and winter rains set in.

THE South Texas Flying School has started operations at the Houston Municipal Airport. The school was organized by John Henry Eagles. Fleet training ships will be used. The company will be distributors for the Fleet ships.

RECENT improvements at the Corpus Christi, Texas, airport include the completion of a ninety-foot by 100-foot hangar and the construction of three shell runways.

THE East Texas Air Transport Company has been incorporated at Beaumont, Texas, with a capital stock of \$5,000. Incorporators are Sam Park Jr., J. W. Gray and H. B. Funchess, Jr.

AN emergency landing field is being built by the Government at Simms, Texas, on the Texarkana-Dallas air route.

#### SOUTHWEST

#### Century Pacific Lines Increase Schedules Twenty Five Per Cent

L. B. MANNING, vice president of the Cord Corporation, recently announced that in order to meet the public demand for air transportation, schedules on the Century-Pacific Lines, Ltd., a Cord Corporation unst, will be increased twenty five per cent. The increased schedules follow a tour by Manning, inspecting the company's service, equipment, terminal facilities, and studying traffic possibilities. He announced that the West Coast division was operating over seventy five per cent of capacity.

Two additional Stinson trimotor ten-passenger Airliners have been ordered for the added service. The Century-Pacific Lincs operates fifty eight daily schedules, covering 5,894 miles daily between Santiago, Los Angeles, Bakersfield, Fresno, Oakland and San Francisco.

EMORY BRUNTE has been appointed Governor for California of the National Aeronautic Association. He is the head of the aviation department of the Associated Oil Company.

OVERLAND Airways, Ltd., operating between San Francisco Bay Airdrome and Sacramento, has reduced its fare twenty-five per cent.

THE Board of Port Commissioners' report of operations at Oakland, Calif., Municipal Airport during July shows the following:

Landings, other than students, 3,099; student, 4,999; transport planes inbound, 496; outbound, 494; transient planes inbound, 286; outbound, 279; transport passengers inbound, 478; transport passengers outbound, 481; transient passengers inbound, 285; transient passengers outbound, 303; taxis passengers, 2,409; total pa

3,956; students enrolled, 365.

GRADING of Oakland Municipal Airport west from the boundary lights has been ordered by the Board of Port Commissioners to clear the way for emergency landings in that area.

A TOTAL of 105 navy planes, on crosscountry navigation flights from San Diego, were checked in at the Naval Reserve base at Oakland Municipal Airport during July.

OPERATIONS reports of San Francisco Bay Airdrome for July show 1,828 planes arrived; 1,787 departed; 3,483 passengers arrived; 3,593 departed.

These figures are exceeded only by August, 1930, according to R. U. St. John, general manager.

CENTURY PACIFIC LINES, LTD., has transferred its east San Francisco Bay ase from Oakland Municipal Airport to San Francisco Bay Airdrome in Alameda. The change increases the airdrome's daily scheduled transport arrivals and departures to fifty-eight.

PARCEL service of the Air Ferries, Ltd., has been extended from the Oakland-San Francisco run to Sacramento through a working arrangement with Varney Air Lines.

During the first month in which this package service was operated, more than 3,000 parcels were transported between the bay cities, according to R. U. St. John, operations manager.

A motorcycle pickup service speeds the packages between the downtown sections of the cities and the terminals.

PLANS for the United States Army Air Corps base and supply depot at Alamed tentatively have been titled "Benton Field" in honor of Lieut. John W. Benton, member of the Pan-American good-will flight of 1927.

The start of construction at the base awaits formal orders from Washington.

RECOMMENDATION that a 165-acre site be developed as a municipal airport has been made to the Palo Alto, Calif., City Council by the city planning commission.

Plans call for four runways ranging from 2,000 to 4,000 feet. The site is a short distance from the city's yacht harbor.

THE T. C. Ryan Flying School of San Diego, Southern California distributor for the Great Lakes Aircraft Corporation, recently reported receipt of a carload of the new 1931 planes with either the upright or inverted Cirrus engines, the latter being the first of their kind which have been shipped to the Pacific Coast.

T. CLAUDE RYAN, head of the T. C. Ryan Flying School in San Diego, has announced the transfer of all ground school instruction, formerly given by the affiliated Pacific Technical University, to new quarters at Ryan Airport.

The training, which will continue to be given under Government transport approval,

will bring about a complete coördination of all flying and ground facilities for Ryan students.

Harry Vorhauer, formerly chief instructor at the Pacific Technical University, has been appointed to the position of chief instructor of all Ryan ground school and mechanical courses.

EXTENSIVE improvements have been completed at Bidwell Airport, municipal airport of Red Bluff, Calif., including extensions of the field to allow all-way take-off and landing.

The runways are 2,800 feet and 2,000 feet long. The field is oiled and equipped with floodlights, boundary lights and an illuminated sign on the hangar. Twenty-four-hour service is provided by the Red Bluff School of Aeronautics, which also operates a school offering private to transport courses. Shell and Standard Products are available. The field is on the beacon route from Los Angeles to Seattle.

#### Aerial "Dollar Day" Success at Denver

MORE THAN 1,200 passengers were carried in eight ships from one field in a single day by four Denver, Colo., flying companies during the city's first aerial "dollar day" recently.

Held primarily for the purpose of increasing public interest in aviation, every precaution was taken to make the "dollar day" 100 per cent safe. Officials of the Denver Municipal Airport, where the event was held, attribute the success in a large measure to proper supervision of passengers and spectators. Special police details were assigned to keep the field clear for the filers.

The Brooks, Reavis, Western and Calhoun flying services, the four concerns participating in the event, each handled passengers separately. A watting line of passengers was formed from the administration building where tickets were sold to the edge of the groun of take-off lanes.

The length of the average flight was about three minutes so that theoretically, one of the eight ships in use took off every half minute. So efficiently was the time schedule worked out that during the greater part of the day three and four ships were taking off at a time. Yet never once did a serious delay result.

According to Capt. Eddie Brooks, at least 90 per cent of the passengers had never been in the air before.

Approximately 350 gallons of gas and ten gallons of oil were used during the day, All companies reported a substantial profit.

THE national headquarters of Mid-Continent Air Express have been established at Denver, Colo., and the entire personnel and equipment of the firm moved from Los Angeles, Calif.

The choice of Denver as a center of activity for Mid-Continent followed the award of air mail contracts requiring administrative offices here. The concern was recently granted the contracts for transportation of mail between Denver, Los Angeles and Pueblo and between El Paso, Fort Worth and Dallas.

REGULAR flying service which will cover the whole park area of Utah and the Grand Canyon in Arizona has been established by Melville Arms, William Eldredge, Wayne Thompson and Lloyd Allen, all of Cedar City, Utah, and Frank Miller, St. George, Utah.

The service is under the supervision of the U. S. Department of Commerce, with Mr. Eldredge, a licensed pilot, in charge. The organization is known as the Southern Utah Flying Service. Daily trips are being made.

BUILDINGS, to cost a total of \$40,000, will be erected at Locomotive Springs, Utah; Jerome, Mountain Home and Weiser, Idaho; and Mecham, Oregon, following the installation of a teletype system on the Varney Air Lines, operating between Salt Lake City and Seattle.

W. E. Kline, in charge of the Airways Division, Department of Commerce, at Salt Lake City, reports that bids will be opened for this construction at Salt Lake City September 1. This will be the second teletype installation in the West, the first being on the transcontinental Boeing Air Transport.

LIGHTING the airway from Salt Lake City to Great Falls, Montana, will be completed within the next few months with more than \$20,000 to be spent. Installation of lights along the airway from Pocatello to Butte will get under way in the near future, according to W. E. Kline, district engineer of the Airways Division. The lighting of the airway from Salt Lake to Great Falls will complete installation of lighting fixtures on all airlines out of this city. In the territory supervised by the Salt Lake office of the Department 2,900 miles of airways will have been lighted when the present work is completed.

THE State of Utah will impose a gasoline tax on airplane fuel in the event the United States Supreme Court sustains the decision of Federal District Judge Kennedy of Wyoming, state officials declare. The Boeing Air Transport Company initiated the case against the State of Wyoming, declaring that the gasoline was used interstate and could not be taxed.

#### CONTACTS

FRANK E. SAMUELS

LONG BEACH, Calif., was the scene of the largest aerial exhibition in its history in July when 140 military planes were demonstrated in formation and aerobatic flying. The demonstration was made to show the ability of West Coast air defense forces gathered in one body and flying as a unit; and to dedicate the Army and Navy Air Reserve field at Long Beach. The army field has been in use for two and a half years and the navy field for four years, but neither has ever had any ceremonial dedication before.

Among the contingents participating in the maneuvers were planes from the following army fields: Crissy, San Francisco; March, Riverside; Rockwell, San Diego; Mathew, Sacramento, and Pearson, Portland, Ore.
Naval squadrons from San Diego and Sand
Point, Seattle, participated, as did planes
from the Griffith Park National Guard field
of Los Angeles. Planes from the Long
Beach army and navy bases also added to
the showing.

HAL H. SMITH, former aircraft manager for the Behrendt-Levy Insurance Company, is again specializing in aircraft insurance. He is making his headquarters in the Rowan Building, Los Angeles, Calif.

THIRTY-EIGHT miles south of Merced is an emergency flying field at Madeira, large enough for the landing and taking off of large transport planes.

Then another twenty miles to the Kern County Municipal Airport at Fresno. Many improvements are being made at this airport. A larger and up-to-date lighting system has been installed and the runways lengthened and widened.

Fifteen miles south and the Selma airport makes a nice point of call for planes flying north or south; or nineteen miles further to the Visalia Airport where pilots may receive weather condition reports from the meteorological station installed there.

At Visalia we made a side trip east, thirtyeight miles to Portersville in the foothills. Back on the highway at the junction at Delano is a commercial flying field, thirtytwo miles south of Visalia, operated by Howard McCaulev.

Thirty miles south is the Bakersfield Municipal Airport. The flying field has been lengthened, all obstructions have been removed and the runways widened.

#### NORTHWEST

SALE of three 40-B4 four-passenger Hornet-powered mail planes to the National Air Transport subsidiary of United Air Lines was reported in August by the Boeing Airplane Company of Seattle, Wash. The mail-passenger biplanes were ferried over United Air Lines to National Air Transport at Chicago. The planes were radio-equipped.

A CHANGE in the organization of the executive personnel of the Boeing Airplane Company was recently announced by President P. G. Johnson. O. L. Egtvedt, as vice president, assumes direct management of the company and G. W. Carr becomes plant manager.

FOUR HOURS and ten minutes from Ketchikan, Alaska, to Seattle, Wash, is the record recently set by Pilot Anseel C. Eckmann of the Alaska-Washington Airways. Favored with a heavy tail wind at a 10,000-foot elevation, the pilot flew five passengers to Seattle in this time.

INAUGURATION of the new Seattle-Victoria-Vancouver triangle city service between Northwestern United States and Candian cities of British Columbia, known as the Canadian Airways, was held Augnust 1

Canadian Airways is operated in association with the Canadian Pacific and the Canadian National Railways. Major D. F. McLaren, former British war flier, is assistant general manager in charge of operations at Vancouver.

#### NEW AERONAUTICAL BOOKS

### THE NAVIGATION OF THE AIR And Meteorology

By CAPT. LESLIE POTTER

THE author has endeavored to prepare a textbook on the navigation of the air, which takes the student step by step through the entire subject to a complete knowledge of air navigation, needing only the experience from practical demonstration in the air. Wherever possible, reasons are given for the inclusion of the various methods, and the circumstances under which they are likely to be of use are explained. The chapters, presented in an order of logical sequence, are followed by a series of questions to be answered by the reader.

#### PRINCIPLES AND PROBLEMS Of Aircraft Engines

By MINOR M. FARLEIGH

T HE purpose of this book is to present in non-technical form sufficient material on the servicing of aircraft engines to give a groundwork in engine maintenance. It has been prepared particularly for the licensed mechanic and pilot, the operator and the flying school student desiring to qualify as a dependable mechanic on aircraft engines or as an efficient pilot.

There are fifteen chapters on the various

phases of engine construction and maintenance. The text, illustrated with a number of photographs and drawings, discusses the elementary theory and design of aircraft engines, valve timing, firing orders, ignition timing, aircraft magnetos and carburetion, superchargers, Iubrication, trouble shooting and propellers. The P. & W. Hornet, Kinner K-5 and the Packard-Diesel engine are discussed in detail. A glossary of aircraft engine terms is included in the contents.

#### DYNAMICS OF AIRPLANES And Airplane Structures

By John E. Younger and Baldwin M. Woods

T HIS book is written on the premise that aeronautical engineering is experiencing subdivision and that a need appears to exist for specialists in aerodynamics: As aeronautical engineering becomes more scientific, the dynamics of the airplane and its members promise to be of first importance.

The text is prepared primarily for graduate students in engineering and for practical engineers. For easy reading, there is required a working knowledge of mathematics up to and including integral calculus with elementary differential equations and a one-year course in engineering mechanics.

Morse Tap Manual

PRACTICAL and useful information concerning the construction and methods of employment of various styles of taps is contained in the "Tap Manual," recently published by the Morse Twist Drill & Machine Company, New Bedford, Mass. The section devoted to lubrication is of especial interest to the users of taps and dies. The booklet was prepared to answer some of the questions asked the company's salesmen by users of taps, and the manufacturer's problems in serving the user's requirements.

#### Stinson Aircraft

STINSON aircraft, produced by the Stinson Aircraft Corporation, Wayne, Mich., are described and illustrated in a circular recently prepared by the company. Details of construction and operation are given. The development of Stinson planes is shown in a number of photographs of the 1925-31 models. Blueprints of the Stinson Junior, Model "S" 1931 Lyncoming-powered four-place cabin monoplane have been prepared. This ship is similar to the 1930 model but incorporates a number of new improvements.

#### Gulf Aviation Atlas

THE second edition of the Aviation Atlas distributed with the compliments of the Gulf Refining Company, Pittsburgh, Pa., was recently announced. The atlas is intended as a presentation of information and data relative to the early history, progress and present development of the aviation industry.

Among the contents are photographs of the early pioneers, transatlantic fliers and pilots who established important records, and a number of early and modern airships and airplanes; a chronological review of aviation history; a map showing the routes of the more important flights in history; a chart showing the comparative development of aviation in various countries; and a map of air transport routes in the United States, South America and Europe.

Hoffman Triangle Parachutes

FOLDER containing photographs which illustrate the operation of the Hoffman Triangle Parachute has been prepared by the Hoffman company. The illustrations show the ejection of the pilot chute when bailing out; the stringing out of the canopy; the non-oscillating steerable descent; and the landing in an upright position.

Electric Arc Welding

THE General Electric Company, Schenectady, N. Y., recently published a booklet, "Arc Welding in Industry." The development of electric arc welding and its uses in industry, especially since the war, are discussed. The text is illustrated with a number of photographs of the results obtained with this process.

Plastic Products

THE General Electric Company recently formed a plastics department in recognition of the rapidly increasing use and importance of products based on synthetic

#### TRADE LITERATURE NEW PAMPHLETS AND BOOKS

OF INTEREST TO THE AERONAUTICAL INDUSTRY

resins and other binders of various types. The company recently prepared a booklet, "Plastic Products," which discusses the development, properties and applications of this material.

#### New Fence Booklet

A NEW fence booklet, "The Border Patrol," with illustrations of typical fence installations, was recently published by the Page Fence Association. The booklet contains various style sheets of chain link and wrought iron picket fences, and presents logical reasons why a well-fenced property is a paying proposition. It may be had by addressing the Page Steel & Wire Company, Bridgeport, Conn.

#### Pyrene Data Chart

A DATA chart containing information on fire protection, "What You Should Know About Fire Extinguishers," has been published by the Pyrene Manufacturing Company. Newark, N. J. The chart is prepared in a form suitable for filing, posting on a wall or bulletin or for carrying. Information is given on the various types of fire extinguishers, the uses for which they are designed and their maintenance.

Weston Tachometer

THE Weston Electrical Instrument Corporation. Newark, N. J., has published a circular illustrating and describing the aircraft electric tachometer manufactured by the company. The equipment consists of two parts. Flexible drive shafts are elimi-

Ex-Cell-O Tipped Tools

CATALOG C-231, "Ex-Cell-O Carboloy Tipped Tools," was recently published by the Ex-Cell-O Aircraft & Tool Corporation, Detroit. Mich. The booklet describes and illustrates the different types of standard tipped general purpose tools produced by the company. There is included a discussion of a group of Ex-Cell-O Carbolov tipped drills with a complete range of dimensions, types and tips. Several types of special Carboloy tipped tools for special application work are included.

G. E. Air Equipment

THE General Electric Company, Schenectady, N. Y., has prepared a circular containing price lists of the aeronautical equipment produced by the company, including navigation and engine instruments and aircraft accessories. The company has also prepared a circular describing and illustrating their aircraft engine temperature indicator and selector switch for multiple connections, and folders on G. E. heating devices and the G. E. soldering iron.

Bristol Steel Aircraft

THE Bristol Aeroplane Company, Ltd., Bristol, England, has prepared a brochure

dealing with the Bristol system of aircraft construction from high tensile steel. The booklet is intended to illustrate some of the most recent developments by the company. There is discussed the relative values in aircraft construction of welded steel; duralumin or a construction utilizing high grade steel tubes, sockets, etc.; and a high-tensile steel corrugated strip primary structure supplemented in the secondary structure by welding or steel tube or duralumin,

G. E. Arc Welders
A BOOKLET devoted to illustrating and describing the construction and purposes of equipment for use in arc welding, which is manufactured by the General Electric Company, was recently published by the G. E. organization. These products which have been developed by the company are known as the WD welding equipment. Particular attention is paid to discussing the development of the various types of welders and the improvements which have been incorporated in their construction.

#### ORGANIZATION PUBLICATIONS

THE Wright Cyclone 575 engine, installed in Colonel Lindburgh's Lockheed Sirius monoplane for his Oriental trip, is featured in the leading article of the Curtiss-Wright-Review for July. The contents include articles on the New Curtiss Navy Shipboard Fighter, the Wright-powered Pitcairn Autogiro, the new Curtiss wind tunnel, the Curtiss-Wright Flying Service in addition to general news of company activities. "Engineering Problems," written for Aero Digest by Theodore Paul Wright, and photographs of the Army Air Corps maneuvers of 1931, are included in the contents

THE first of a series of articles on the personnel of the Vacuum Oil Company is contained in the July issue of Vacuum Oil News. The history and career of each member of the board of directors are presented and the personnel and functions of various executive committees are given. In the field of aviation, there are articles on the use of Mobiloil by the Shippe-Johnson aerial photographic expedition to Peru and by the Do. X on the transatlantic flight to Brazil. General news of company activities and the use of Mobiloil on two African land expeditions comprise the remainder of the contents. The text is illustrated with numerous photographs.

THE Claude Neon News for July presents a number of interesting photographs of Claude Neon illuminated signs installed for advertising purposes throughout the country and in foreign cities.

PHOTOGRAPHS of the autogiros being used by various commercial firms to promote sales in widely divergent lines feature the July issue of Autogiro News. The issue includes news of the activities of autogiro owners, the appointment of new dealers and recent autogiro sales. The autogiro in relation to aircraft insurance rates is discussed

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## List of Events at the Air Races

Open to cabin or open type planes having engines with not less than 1,200 cu. in. displacement, carrying A. T. C.

or Group II License.

Event 23. Sportsman pilots' fiftymile race (ten laps). Cabin and open type planes of not more than 1,000 cu. in., carrying A. T. C. or Group II

Cu. in., carrying A. T. C. or Group II License. Sportsman Pilot Trophy. Event 16. Autogiro exhibition and

competition.

Event 31. Civilian acrobatic exhibi-

tion. Teams of three, by invitation.

Event 13. Free-for-all (men pilots) fifty-mile race (five laps). Not less than 1,200 cu. in. Purse, \$3,600. Event 35. Women pilots. Dead

stick landing contest. Prizes \$200.

Event 39. Free-for-all (men only) parachute jumping contest for professionals. Purse \$200.

#### MONDAY, SEPTEMBER 7

Event 32. Charles E. Thompson Trophy Race with purse of \$15,000. High speed classic of the races. Freefor-all, open to any type of plane with any type of engine or engines. Ten laps over a ten-mile course. Qualifying speed of 175 miles an hour required.

Event 29. Women pilots. Fifty-mile race (five laps). Cabin and open type planes having engines with not more than 1,875 cu. in. displacement, carry-

ing A. T. C. or Group II License. Purse \$3,000.

Event 36. Air transport speed and efficiency contest. Fifty miles (five laps). Open to single-engined cabin planes, including combination type (airplanes with open pilot's cockpit but cabin space for passengers, freight, mail and express). Award by 1931 National Air Tour merit formula. Purse \$1,500.

Event B. Thirty-mile race (six laps). Cabin and open type planes of not more than 115 cu. in., carrying A. T. C. or Group II License. Purse \$500.

Event 16. Autogiro exhibition and competition.

Event 31. Civilian acrobatic exhibi-

tion. Teams of three, by invitation. \$300.

Event 34. Dead stick landing contest. Prizes \$200.

Event 39. Free-for-all (men only) parachute jumping contest for professionals. Purse \$200.

#### SECOND NATIONAL SOARING CONTEST

(Continued from page 39)

ington, D. C., waged a grim battle of skill, judgment, and physical endurance all day over south mountain ridge. Franklin was ultimately disqualified when he lost his lift and was forced to land at the base of the mountain. Stickler and Hastings fought it out and at dusk made their landings, Stickler on the mountain top and Hastings at the airport. Hastings' duration was but one minute and thirty seconds greater than the Washington entrant. At first it was thought Hastings, too, had disqualified by the airport landing but inasmuch as the start had been made from that spot by airplane-tow, the flight was ruled official eclipsing Jack O'Meara's 1930 record of 6 hours 20 minutes.

Stickler's flight was most remarkable because of the mountain top landing at dusk and also because it was only his second soaring flight.

#### Eaton Demonstrates Cloud Hopping

Towed aloft by his own personal airplane, Warren E. Eaton of Norwich, New York, cut loose at an altitude of 6,600 feet over Wellsburg. From this point he hopped from cloud to cloud, gaining height over their fleecy bulks and losing it as he crossed from one to the other. After an hour from the time of take-off, he arrived at the airport in an easy landing.

#### The Accidents

Unfortunately accidents seem to attend contests of this kind. Last year two veteran pilots, Dr. Klemperer and W. Hawley Bowlus escaped from serious injury in emergency landings. This year the toll has been greater and includes injuries to Major Purcell, Captain Phillips and Fritz Germershausen who were piloting ships when they were injured. Several members of a launching crew were also slightly injured when a launching sling fouled on the nose hook of Captain Pippig's glider during the take-off. It is to be regretted that all accidents could not have been avoided but we must not forget that in any sport of similar calibre, such as motor boat, motorcycle or automobile racing, or even riding and polo, we find accidents persist after years of experience. The effective radio communications and emergency facilities provided by the communications and emergency facilities provided by the communications and emergency facilities provided by the communications.

test managers deserve a great measure of praise for their efficient handling of the unfortunate accidents. We are happy to note that at the time of writing all accident victims were on the road to recovery.

#### Contest Results and List of Honors

Duration—Albert S. Hastings, seven hours and 30 minutes, \$100; James L. Stickler, seven hours, 28 minutes and five seconds, \$75; Franklin K. Iszard, six hours and three minutes, \$25.

Distance—Martin Schempp, 15 miles, \$100; W. Hawley Bowlus, 12 miles, \$75; Albert Hastings, eight miles, \$25. Altitude—Martin Schempp, 3,130 feet, \$100; Albert E. Hastings, 1,960.96 feet, \$75; Prof. R. E. Franklin, 1,300 feet, \$25.

Aggregate time—Martin Schempp, eight hours, 42 minutes and 46 seconds, \$50; James L. Stickler, seven hours, 28 minutes and five seconds, \$30; Franklin K. Iszard, six hours and three minutes, \$20; A. B. Schultz, five hours and five minutes, \$12.50.

Spot Landing—Edward Barton, three inches, \$50; R. H. Holderman, 10 inches, \$30; Robert Eaton, 13 inches, \$20. Points—Albert E. Hastings, six; Martin Schempp, six. L. F. Ross was official referee and Peter Altman was F.A.I. Timer and Chairman, Technical Committee.



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Span, 34 feet. Length overall, 23 feet, 8 inches. Weight empty, 1,070 pounds. Top speed, 110 miles per hour. Flight range with 2 passengers and 100 pounds of baggage, 550 miles. Baggage compartment takes four full-size Gladstone bags. Standard equipment includes wood propeller, tachometer, oil thermometer, oil temperature gauge, altimeter, fuel gauge, safety belt, tool kit, 35 gallon gas tank and 6:50 x 10 air wheels.

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## JOINING THE CATERPILLARS

Brief Accounts of Emergency Jumps which Won Membership in This Unique Organization

M AJOR JAMES H. DOOLITTLE, former army flier, joined the Caterpillar Club for the second time at Curtiss-Steinberg Airport, East St. Louis, on June 23.

While testing his racing plane, the "400," Major Doolittle made a successful jump from about 300 feet altitude after the right aileron and part of the left aileron carried away at a speed of 250 miles an hour. The ship, a low-wing speed plane designed by Major Doolittle, was only 100 feet from the ground when the accident occurred. Using the nerve and quick thinking for which he is noted, Doolittle pulled the ship up and to the right, away from the populated area of the airport, turned it over on its back, and fell out. The parachute cracked open and Doolittle landed hard but safely with only a rope burn across the back of the neck to show for the experience. He even saved the rip cord and ring.

In building this high-speed ship Doolittle used a pair of racing wings from a previous speed plane, and apparently they were too old or too weak to stand the strain he imposed on them. It was just twelve seconds by actual count from the time the ailerons came off until Doclittle left the cockpit.

The chute Doolittle used had been repacked a week previously by Sergeant Jimmie Tate, parachute expert for the Thirty-fifth Division Air Service, Missouri National Guard. Sergeant Tate has packed the chutes used in ten successful emergency jumps, including two by Col. Lindbergh and one by Captain Fred Nelson, of the regular army.



S O far this year there has been a terrific slump in Caterpillar Club, common, according to an account in the Air Corps News Letter. The records disclose that during the period from Janury 1 to July 1, 1930, a total of sixty-five emergency jumps were made, as against thirty-four for the same period this year, a drop of thirty-one points.

At this time ro figures are available as to the total flying time for this year as compared to last year, so that no other comparisons may be made and no conclusion reached as to the cause for the welcomed slump. However, as far as military aviation is concerned, it may be safely assumed that equally as much, if not more, flying time was accumulated the first half of this year as the year before. Considering the Air Corps alone,



Triangle chute showing how the jumper manipulates the risers to steer the chute

it may be said that considerably more flying time was accumulated this year, since the maneuvers alone accounted for approximately 38,000 hours. Despite this increase in flying time, the records disclose that, taking into consideration only emergency jumps made by Air Corps Regular and Reserve personnel, five more emergency jumps were made during the first six months of last year than this year, the figures being twenty-three against eighteen. To date 371 lives have been saved by the parachute in this country.

The latest members of the Caterpillar Club to be honored with Second Degrees are Major James H. Doolittle and Second Lieutenant Arthur R, Kingham, both of the Air Corps Reserve. Major Doolittle, whose first jump occurred during the Air Races at Cleveland, Ohio, September 1, 1929, received his second initiation on June 23 at East St. Louis, Illinois, when the fabric tore loose from the wings of his plane while traveling at an indicated speed of 235 miles an hour. Lieut. Kingham, who became a "silk sailor" on December 6, 1930, near Waco, Texas, while a Flying Cadet undergoing training, jumped again on June 9 when, while flying near Sacramento, Calif., his pursuit plane went out of control at 1,500 feet altitude

Colonel Charles A. Lindbergh is still "Monarch" of the Caterpillars with four jumps. There are no Third Degree members, so far as known, but Second Degree

members, in addition to Doolittle and Kingham, are: Captain Frank O'D. Hunter, Lieuts. Eugene H. Barksdale (deceased), James T. Hutchison and Sergeant Miller, Air Corps; Ernest E. Dryer, James Rutledge, Al. Wilson, Samuel J. Samson, Harry Sievers and Verne E. Treat, civilian pilots.

J ACK WEBSTER, National Air Transport mail pilot, turned back from an unpremeditated trans-Atlantic hop just in time to miss what might have been a long damp session with the beligerent old ocean after he bailed out of a fog-bound plane whose gasoline tanks were drained dry.

The pilot was bent on getting the mail from Cleveland to New York and tackled a sky filled with fog and clouds. After two hours of flying he dipped down to find green water reaching for his wheels. He changed his course and ten minutes later found himself, still in a sky of close white fog, with dry gasoline tanks. A parachute carried him safely down to Cateroillar Club membership.

It was in December, 1928, that the mail pilot took off from Bellefont on his Cleveland-New York run. He flew steadily through fog, the ceiling of which was so low that when he descended to locate himself he found the trees slipping along hardly fifty feet below his wings. He climbed again and repeated the performance several times. Finally he came down to 400 feet and saw water.

"I decided it must be Long Island Sound," Webster said. "So I flew on for fifteen minutes on the same course. When I came down again I still found water under me. I decided to turn north and began climbing at the same time. At 4,000 feet I cleared the clouds and was sailing along in a blue sky when I discovered that my main gasoline tanks had gone dry.

"Down I went through the fog, not knowing where I would land. The wind ripped away my helmet and goggles. Presently I saw the ground 200 feet below and a moment later landed in treetops. I walked to a gas station where I learned that I was down near Suffield, Connecticut. When I located the plane across the river, the postmaster of a nearby town had already removed the mail and forwarded it by train.

"It is evident that I had been out over the Atlantic when I dipped down to get my bearings. It was lucky for me that I turned back, since my ten minutes of gas would hardly have carried me across."



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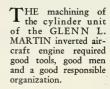




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## FOREIGN NEWS IN BRIEF

Compiled from reports from AERO DIGEST correspondents and the Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce.

#### ENGLAND

King's Cup Air Race Flown in Inclement Weather

NDER difficult conditions of weather. rain mist and low clouds, the annual King's Cup Air Race of approximately 1,000 miles around England was flown this year on July 25. Only once previously, in 1925, has worse weather been encountered in this contest. However, out of forty planes starting the race, twenty crossed the finish line as competitors. There was no serious accident or injuries. Some of the entrants had completed less than 100 hours of solo

Six of the first ten planes to finish the circuit at Heston, where the race began, were Royal Air Force officers, including the winner and the second man home. The R. A. F. fliers were classed as amateur pilots in the regulations governing the race this year.

Despite the weather, the average speeds attained by the light airplanes which finished were unusually high. The winner, Flying Officer E. C. T. Edwards, piloted his Blackburn "Bluebird" biplane over the course of 928.5 miles at an average speed of 117.8 miles per hour. The runner up, Flight Lieutenant L. F. G. Gibbons, did 109.1 miles per hour in a Hermes-powered "Spartan," The fastest time on the race was attained by Lieutenant Rodd in a "Puss-Moth" cabin monoplane, carrying a passenger, at 127 miles per hour,

Four women started the race, but only one, Miss Delia Crossley, completed the contest, crossing the line the last of the twenty finishers. In last year's race, Miss Winifred Brown eclipsed all opposition and won. Miss Brown was forced to abandon the race this year.

Bluebird and Spartan planes took leading

places in the event for the first time in this contest.

ADAPTATION to freight transport of a DeHavilland Puss Moth passenger plane has been announced by the manufacturers. The two passenger seats, dual controls and upholstery will be eliminated. Two reinforced plywood bulkheads will be built into the fuselage, the first of these directly aft of the pilot's seat and the other approximately six feet further aft. It is reported that the plane will have a cruising speed of 110 miles per hour and that its payload with 26.4 gallons of gasoline will be 515 pounds, or 429 pounds with forty-two gallons of gaso-

#### High Speeds Made in Standard Light Plane Race

LIGHT AIRPLANES maintained unusually high speeds in a recent fifty-mile handicap race around the Isle of Thanet, although heavy rain and strong winds were encountered by contestants.

The winner, G. A. Pennington, flying instructor, averaged 128 miles per hour in a "Puss Moth" cabin monoplane. E. W. Perceival, starting from scratch, was timed over the circuit at 135 miles per hour. Equally as impressive, when allowance is made for the difference in price of the machines, was the flight of L. M. Balfour, private pilot. He covered the course at 117 miles per hour in a standard "Gipsy Moth."

#### THE SCHNEIDER TROPHY RACE

England, France and Italy Expected to

Compete FINAL stages of flight training and preparation generally have begun for the Schneider Trophy Contest to be held September 12 over the Solent and Spithead course, Southampton, England. Three national teams apparently will participate-Great Britain, Italy and France. While information is lacking concerning the intentions of the French team, Great Britain and Italy have developed new high-speed planes for this year's contest and speeds in the vicinity of 400 miles per hour are confidently expected to be attained.

· The 1931 race will be flown over a triangular course instead of over a quadrilateral course as in other years. Competing planes will speed over a route of approximately thirty-one land miles, to be flown seven times around for a distance of 350 kilometers, or 217.47 land miles. The course selected was chosen as the only place providing a sufficient expanse of protected water. Draws for positions in the race were recently made under the supervision of the Royal Aero Club. As a result it was determined that Great Britain would start first, France second and Italy third. One machine from each country will start in that order and a second and a third will follow in the same order, until nine planes are flying the course, three representing each country.

A new machine, which Britain has developed, is a Supermarine S6 monoplane, similar in general appearance to the craft which won the Trophy at an average speed of 328.63 miles an hour in 1929, but driven by a Rolls-Royce engine developing considerably greater power than the 1,900 horsepower in the 1929 engines and incorporating certain design improvements. Squadron Leader Orlebar, holder of the world's speed record of 357.7 miles per hour and administrative chief of the British Schneider Trophy team this year, recently made first flights in the new racing seaplane which is likely to lead the defending team.

France has intimated to the Air Ministry arrival at Calshot on August 29fourteen days before the race-of six racing pilots, attended by seven other officers and sixty-seven service and civilian me-

Two officers, ten men and three training high-speed seaplanes of the Italian Air Force recently started for Calshot for preliminary trials, to be followed on August 26 by the remainder of the team, consisting of twelve officers, forty men and the new Italian racing planes specially built this year for the contest.

From Italy have issued reports that newly designed seaplanes, possessing novel features in arrangement of engines and propellers, are expected to attain speeds in the neighborhood of 400 miles an hour. France is more reticent, but it is known that her new engines have been running on test for some time. Competition for the Schneider Trophy

has caused marked development in plane speed and has accelerated progress in aircraft engine construction. In ten years the winning speed has leaped from 117 miles per hour to 328.63 miles per hour.



Preparing New British Rolls-Royce-powered Supermarine for Schneider Trophy Race training flight

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#### **GERMANY**

#### Transatlantic Voyage in Graf Zeppelin for \$750

PASSENGERS are to be booked for the two transatlantic flights of the Graf Zeppelin, each from Germany to Brazil and return and scheduled in August and September, according to a recent announcement of the Graf's sponsors. They will be carried at a reduced rate of \$750 one way, a twenty-five per cent reduction, if passage is also booked to or from Europe and the United States on one of the steamers of the Hamburg-American line, general agents for the Zeppelin company.

The Zeppelin is scheduled to leave Friedrichshafen, Germany, August 26 and September 19 for the westward flights, and Pernambuco, Brazil, September 1 and 24 for the return journeys. The regular rate for the aerial voyage between Friedrichshafen to Pernambuco, requiring three and one-half to four days, is \$1,000. The reduced rate is available to passengers desiring to leave New York by steamship in time to catch the Graf on the take-off from Germany, or to return to New York form Germany after the flight to Brazil.

#### EDWIN P. A. HEINZE

#### Long-Distance Sail-Flights Made

AT the Rhôn sail-flying meet, in progress at the moment of this writing, the German sail-flier, Groenhoff, completed a long-distance flight, landing near Magdeburg, 220 kilometers (137 miles) distant in a straight line from the starting point. Although he was prepared to, remain, in the air at night, which would have enabled him to extend his flight, he decided to land at dusk. On the same day, Wolf Hirth landed at Friedeberg-Saale, 180 kilometers (112 miles) away from his starting point.

A feature of this year's Rhön meeting was the performance of a tailless sail-plane evolved by Herr Schulte of Magdeburg, who has designed a peculiar form of wing.

THE Luft Hansa conducted recently a large number of sightseoing flights over Berlin. No fewer than 1,500 persons were carried. The price was reduced to five marks (approximately one dollar) for each person, and the tickets were sold in closed envelopes, some of which contained free return tickets for long-distance flights to many German towns, of which the fortunate recipients could avail themselves any date they chose after Whitsun.

#### Dr. Kipfer Plans New Flight

THE successful high-altitude balloon ascent made May 27 by the Swiss, Professor Piccard, with his assistant, Dr. Kipfer, from Augsburg in Germany, has been recognized as an international record for Switzerland by the international body, which has filed the record with an altitude of 15/81 metres (51/75 feet) in the class of balloons of 4,000 cubic metres (141,260 cubic feet) and more. Dr. Kipfer plans to make a new attempt on his own, in which he hopes to reach an altitude of 100,000

THE new Junkers Ju 52 freight plane has completed a tour of eastern Europe. Favorable comment was especially caused by its exceptionally spacious interior.

THE Luft Hansa is having Junkers Diesel motors installed in a big trimotored plane which is to be employed at first for air freight transportation.

GERD VON HOEPPNER vice president of the Fédération Aéronautique Internationale and of the German Aero Club, reporting on the meeting of the F. A. I. recently held at Bucharest, says that the German proposal to provide new regulations for sail-flying has been accepted by the international body. Hitherto, the regulations were very similar to those for powered planes, which have long been felt as a drawback since the conditions for sail-flight are so materially different from those for powered flight. It is expected that the new regulations will give a stimulus to further attempts at sail-flying records.

ON the initiative of the German Air Board the international body instituted a sail-flying sub-committee to cooperate with the international study committee formed some time ago in Germany. The F.A.I. accepted the German proposal for modifying the basic regulations for the bi-annual Grand European Air Competition. A resolution was passed to the effect that in future the regulations for this competition are to be issued at the latest on October 1 of the year preceding the event so as to allow makers at least nine months for preparation.

A VERY important proposal entered by the Roumanian Aero Club was likewise accepted. All national bodies are to approach their governments with a view to inducing them to come to an international agreement in respect to the issue of passports for planes, which will allow fliers to cross any border without the tedious process of asking permission from each country to be allowed to enter. The Roumanians suggest that it shall suffice to obtain on the passport the visum of the consulate concerned and of the national aero club. This would very greatly facilitate international air touring, now bound with barriers of red tape.

#### THE NETHERLANDS

To Build Curtiss Military Planes in Holland

THE AVIOLANDA, N. V., licensee in Holland for the Curtiss-Wright Export Corporation, New York, is building six Curtiss Hawk pursuit planes for the Dutch East Indies Air Force, similar to those now in general use by the United States Army Air Corps.

The planes are of the P-6 type with Curtiss Conqueror water-cooled engines developing 675 horsepower at 2,400 revolutions per minute.

The Dutch East Indies Air Force has standardized on the Curtiss Hawk as regulation equipment for their military units

according to H. Adolph Burgerhout of Aviolanda, N. V., proprietor of the factory at Papendrecht near Rotterdam, Holland.

The Curtiss Aeroplane and Motor Company of Buffalo, N. Y., has sent George Warren, project engineer, and Joseph Killen, welding expert, to assist in the manufacture of the planes.

#### FRANCE

#### French Aeronautical Exports Increased in 1930

EXPORTS of aeronautical equipment by France during the first five months of 1931 showed an increase over the corresponding period of 1930, according to information recently made available.

The total value of aeronautical exports for the January-May period of this year was approximately \$3,225,000, as compared with \$3,209,000 in the corresponding period of last year. Practically all of the aircraft exported were landplanes.

Servia, the largest purchaser, imported from France 195 tons of aircraft equipment. Greece, the second largest buyer, imported 181 tons. French Indo-China, Brazil, Belgium, Turkey, Madagascar, Russia Bad French West Africa were the next largest buyers, respectively, with purchases of from forty to sixty tons.

PLANS for the organization of a glider club by members of the Paris Post of the American Legion were recently announced. It is expected that the club will affiliate with Avia, the French organization in which are grouped practically all of the glider clubs in France. The American club plans to purchase a glider and use the landing field at St. Cyr, near Paris.

#### CANADA

AIR mail and passenger transport service between Boston, Mass., Bangor, Me., Calais, Saint John and Halifax, Canada, has been inaugurated by Pan-American Airways.

EASTERN AIRWAYS, LTD., has begun a daily service between Halifax and Saint John in conjunction with Pan-American Airways' service between the two cities. The plane, a Wright-powered Aristocrat, leaves Saint John at 9:30 a.m. every day except Sunday and returns at 3 p.m.

PAN-AMERICAN AIRWAYS has established facilities for its planes at the Milidigeville sepalane base. Two floats, each sixteen feet in length and provided with railings and steps for the convenience of passengers in boarding and leaving amphibions, have been constructed.

A SPOT landing contest was sponsored recently by the Saint John Flying Club. H. Comeau, the winner, was awarded a silver cup contributed by C. S. Kent, instructor. The club plans to hold one of these contests each month and to award the cup to the winner who holds it until the next contest.

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### LATIN AMERICAN AVIATION

Mexico Largest Airplane Market for United States in May

M EXICO was the largest purchaser of airplanes, aircraft engines and parts of United States manufacture during the month of May, according to information recently made available. Mexico during the month bought three airplanes totaling \$91,237 in value, one engine valued at \$7,800 and aeronautical parts with a total value of \$2,872.

While Mexico lead all other countries as an importer of American aeronautical products in May, Brazil was the next largest buyer in Latin America. This country nurchased five aircraft engines with a total value of \$17.338 and aircraft parts and accessories valued ot \$15,166. Colombia was next with three airplanes valued at a total of \$14,805. Peru bought two airplanes valued at a total of \$10,500 and aircraft parts totaling \$4,211. Trinidad and Tobago purchased two planes with a total value of \$9,094 and parts totaling \$1,040 in value. Panama imported one American plane valued at \$6,008 and \$336 worth of parts. One plane at \$1,200 and \$826 worth of parts were shipped to Guatemala. Chile bought \$2,009 worth of parts, and Argentina, \$6,089 worth of parts. Parts with a total value of \$4,735 went to Cuba; and \$56 worth of parts were imported from the United States by Honduras. Porto Rico bought two American engines with a total value of \$11,208 and parts at \$28.

Mexican Airlines Increase in Mileage AIRCRAFT engaged in commercial air transportation in Mexico flew more than 500,000 miles farther in 1930 than in 1929. covering a total of 2,485,810 miles, according to a report issued by Edward D. Mc-Laughlin, U. S. Assistant Trade Commissioner at Mexico City.

WORK on the Central Airport in Mexico City is being speeded up with the intention of having the port completed by the middle of September. The 16th of that month being the national holiday, it is planned to have the inauguration ceremonies of the field on that day.

Panama to Buy Planes PRESIDENT ALFARO of Panama recently confirmed reports that the proposed trip of Secretary of Government Francisco Arias to the United States is for the purpose of purchasing airplanes for use of the postal and police services, in addition to other general equipment.

SCADTA and Pan American Coordinate Airline Services

AFFILIATION of Pan American Airways, the international air transport system of the United States, and SCADTA, the national air mail system of Colombia, was announced recently in a joint statement authorized by J. Trippe, president of the Pan American system, and Herr Peter von Bauer, director general of SCADTA, As the result of agreements effected between the two companies, direct air mail service will be provided for the first time between Colombia and the West Indies, Central and South America, and air service between Colombia and the United States is expected to be greatly improved.

Pan American Airways has acquired a stock interest in SCADTA and a member of Pan American has been elected to the board of directors of the Colombian company. International working agreements have been concluded, effecting coordination of air mail, passenger and express facilities.

#### Complete Colombian Flight

CAPTAINS Lema Posada, Esquerra and Lieutenant Lievano of the Colombian Air Force, have successfully completed a flight of 1.455 kilometers in Colombia, stopping at nine cities en route. The flight required ascents of more than 17,000 feet over the Andes at several points on the route.

#### Form New Airline in Colombia

A NEW airline has been established between Bogota and the cities on the eastern plains of Colombia. The line is operated by the Compañia Aerea Llanera, recently organized by Lieut, Camilo Daza of the Colombia Air Force. The company is capitalized at \$50,000, subscribed by business men and cattle raisers.

Headquarters will be at Villavicencio, one of the important cities in the cattle district. The officials of the company are as follows: A. Uribe, E. Eylers and F. Arango, managers; P. Salazar, P. Rueda, D. Corredor, M. Dorsonville and S. Prieto, directors; and R. Jiménez, secretary.

The line will transport mail, passengers and freight.

#### Curtiss-Wright Engines to be Built by Argentine Government

THE Curtiss-Wright Export Corporation has negotiated a contract with the Republic of Argentina, giving that government the exclusive manufacturing rights for the complete line of Curtiss-Wright Whirlwind and Cyclone engines in Argentina, according to a recent announcement of C. W. Webster. vice president of the Export corporation. The agreement calls for the manufacture of at least 250 engines in Argentina over a period of five years and includes an initial order of from ten to twenty-five complete engines and a large quantity of spare parts to be built in the Curtiss-Wright plant at Paterson, N. J., U. S. A.

For a number of years the Argentine Government has maintained a completely equipped engine factory at Cordoba, about 375 miles west of Buenos Aires where French engines of the Lorraine, Le Rhone, and Hispano types have been manufactured. It is understood that the production of these types is to be discontinued in the factory and that the Wright Whirlwind engines of 165, 240, and 300 horsepowers and the Wright Cyclone engine of 575 horsepower, are to be



Route of recent flight through Colombia

THE Argentine Government will operate in the future the air mail and passenger lines between Buenos Aires and Paraguay and between Buenos Aires and Rio Gallegos in southern Argentina. These airlines were formerly operated by the Aeroposta Argentina, a subsidiary of the French Aeropostale.

THROUGH a special agreement with the Chilean Government, Pan American-Grace Airways, Inc., has obtained permission to extend its passenger service direct from Panama to Santiago, Chile. Heretofore, air passengers could not be carried in Chile except on the government-operated Chilean National Airways. Pan American planes with United States air mail had to land all passengers at Arica. Under the new arrangement the bookings will be limited to through passengers from countries other than Chile. The Chilean line will retain its monopoly on all passenger traffic between points within the country.

Trimotored Ford transports, with accommodations for fourteen passengers and carrying a crew of four, will be used on the new airline, the first air passenger service between the United States and Chile.

THE Aero Club of Ecuador has submitted to the government for official approval a program of air traffic regulations for Ecuador. This program was worked out by Pilot R. A. Dillon, secretary of the club.

The Ecuador air club is preparing in cooperation with Capt. Leonidas del Campo a series of air maps of the air routes along the cost of Ecuador.

THE commission sent by the Commander of the Fourth Military Zone of Ecuador to locate sites for emergency landing fields in the province of Manabi recently reported that very satisfactory locations have been found near the towns of Picoaza and Rocca-

#### New Brazilian Air Line

AIR MAIL service has been established by the Brazilian Government between Sao Paulo and Rio de Janeiro. Planes will leave Rio at noon on Mondays, Wednesdays and Fridays and Sao Paulo at 1 p.m., on Tuesdays Thursdays and Saturdays. The trip each way requires three hours. Each plane will have a capacity of approximately fortyfive pounds of mail in addition to passengers.

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## THE JERSEY "DARNING NEEDLE"

In Conjunction with the Elmira Soaring Competition this year several model contests were held on the Elmira Airport Saturday, August 8th. The hand-launched glider event went to Ted Bellak of 496 South 16th Street, Newark, N. J. He captured first prize with a duration of twenty-two seconds. Thanks to Ted we have for our study this month full details and description of The Jersey "Darning Needle" which had all competition "sewed up in a bag".

But before we turn to the description of Ted's remarkable model, let's stop for a glimpse of the busy airport where the model meet was staged that eventful Saturday afternoon. The weather was warm and sultry. Clouds covered the blistering sun from time to time. There was scarcely a breath of moving air. The large gliders were operating from the airport in towed flights only. Soaring from the hillsides was not even con-

#### R. E. DOWD

sidered by the pilots who gathered around the hangar.

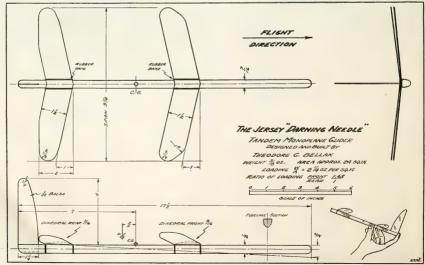
Out on the field along by the fence we noticed a group of boys and young men moving farther away from the field head-quarters. The announcer made the timely explanation over the amplifiers that the model competitions were about to be run off. This sent us scurrying after them for fear we would miss some-

We overtook the crowd just as they came to a halt where the excited contest-ants opened their curiously shaped kits and carrying cases. In the confusion we heard familiar voices and on checking up found ourselves in the midst of a lot of veteran model builders. There was Percy Pierce of Philadelphia, who used

to hold most of the records back in 1910. Nearby was Jack Billings of Long Island, N. Y., who makes the famous Broadfield Model Planes, and Lieutenatt Ralph Barnaby, famous glider pilot, who started model building when he was a boy. George Page of the Curtiss engineering staff, another early model builder, also was present and was already coaching a contestant.

The thought occurred to us then that here were men from many parts of the country, all aviation enthusiasts, all believers in the great future of air travel, and yet every one started by building models—and what is more, never outgrew his interest in them. This certainly was an impressive tribute to the value of model experimentation.

Nearby were some little tots not over five or six years old, crowding between the spectators to get a closer look at the models being assembled. Two of them



held in their badly soiled hands roughly made wooden gliders with a wing span of only about three inches. From time to time these were unceremoniously hurled into the air only to flutter down into the eager hands of their owners. Here, too, were veterans in the making, model builders now, but designers, manufacturers, and operators of aircraft tomorrow.

The starter's whistle put an end to these musings and the contestants, who had been nervously fumbling with clips and rubber bands in order to get their models assembled, now lined up for official trials. One by one the model gliders shot upwards from the hands of the launchers. They looped and circled but returned to the ground in five to ten seconds. Then came the surprise. Ted Bellak stepped from the lineup and after winding himself up like a baseball pitcher hurled his entry straight up to an altitude of seventy-five to a hundred feet. Here, instead of looping and losing height, it flattened out abruptly and glided beautifully to an adjoining field. A murmur of approval passed through the crowd. "Twenty-two seconds" called the timer, and the crowd broke into applause and tooting of auto horns.

Well, that's how it all happened, and now before we go further we want to know more about Ted Bellak. He is one of the Eastern champion builders, whose experience dates back five years. His first prize in competition was won in 1928, and in 1929 he was the New Jersey state representative in the Detroit National contests. His winnings are too numerous to list here but mention should be made of his success in joining the Alpha Nu Club, whose membership is restricted to model builders with official duration records of at least 8 minutes outdoors and 10 minutes indoors. So much by way of introduction to Ted. who has been a regular reader of Junior Activities and a staunch friend of Aero Digest for years.

### Description of the Jersey "Darning Needle"

The entire model is made of balsa wood with the exception of the rubber bands for attaching the planes and the cement used for assembling the parts. This is the first unique feature of the model. All wire clips, hooks, fittings, weights, etc. have been effectively eliminated.

### The Fuselage and Fin

A straight stick of balsa 7-16x1-2x17-12- inches will make the fuselage. It is only necessary to round the corners as indicated in the cross section. The rounding of the ends is done last. At the rear a 1-32 inch wide groove, about 3-8 inch deep, is cut with a razor blade for the fin. It does not slot through the fuselage for this has a tendency to weaken the construction. The fin is cut from 1-32 inch thick balsa with the grain running vertically, of course. Ambroid



Percy Pierce (holding model) coaching a contestant with John Billings

serves to make the assembly.

The Planes

The outlines of the front and rear planes are different as indicated on the drawing. It is more than probable that either outline could have been used for both planes but in this case we are offering the prize winner exactly as it is without attempting any changes.

Balsa ½ inch thick by 1½ inches wide will make the planes. The section is flat on the bottom side and more or less of a standard curvature on the upper surface. As indicated, the dihedral angle of the front plane is 9-16 inch while the rear is only 7-16 inch. This is measured, in this case, as the distance from a line connecting the wing tips to the upper surface of the wing section at the center.

Ted tells us that models of this design will not work well unless the dihedral angles of the front and rear planes are different. We find this condition in the actual Dragon Fly. (See November issue of Aero Droest.) In this case, however, the rear dihedral is greater, probably to increase the fin area to offset the large head. After all, the important thing is doubtless to use different dihedrals so as to avoid direct down wash on the following surface. In this particular model it would seem that the spacing of three to four chord lengths between the surfaces should minimize any

such effect

As indicated the front plane has no incidence. The 1-16 inch by 7-16 inch strip of balsa, which serves to splice the right and left wings at the base, is simply cut away to give the correct dihedral angle. In the rear there is quite a negative incidence. The drawing clearly shows a projection of the bottom surface of the rear wing section, and the point where this projection lies at the very front end of the model. If this is followed, by sighting along the bottom of the rear wing, it will not be necessary to bother with measuring of angles and other fussy dimensions. The best way to proceed is to make the center block 7-16 inch wide by 1-8 inch thick and after the wing parts are securely mounted at the correct dihedral, to trim the bottom surface until the correct incidence is sighted.

### The Theory of the Tandem

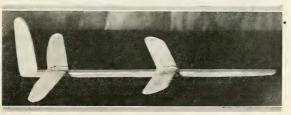
As mentioned before, the tandem type of airplane is not new to our readers, but perhaps we should check into it a little further in order to see just why it is the logical type for such contests as the hand-launched duration event.

We are all familiar with the standard main-plane-first arrangement of stable surfaces. This is sometimes called the Penaud system. It will be recalled that the center of gravity is slightly forward of the actual center of lift and that this couple is balanced by a downward pressure on the stabilizer. No such down pressure is to be found in the tandem arrangement. However, the forward surface must carry a higher wing loading, or in other words, must have a greater incidence, than the rear. If the areas are approximately the same this means the center of gravity will be nearer the front surface. Incidentally, after a model is adjusted to fly with good stability, the ratio of loading on the two surfaces is simply a matter of being inversely in proportion to the distances.

Front 1.65

In our case it is Rear 1

Now the outstanding difference between the Penaud and the tandem system, as we have noted, is that in one case an air load is carried by a surface, and in the other, both surfaces lift. It can be readily seen that the tendency to climb



Close-up view of the Jersey "Darning Needle"

abruptly into a loop would be far more pronounced in the Penaud system, particularly if the negative stabilizer angle were excessive. This can be easily denionstrated with a model glider having an adjustable stabilizer. If launched forcibly as with a sling, after having been adjusted to glide properly, it climbs up into a loop. With more power it will make multiple loops. If the stabilizer angle now be flattened instead of negative, the model can be shot to a great height but not having a correct gliding adjustment it will nose over into a dive. While excess power will climb the tandem type also, no such pronounced tendency to loop is apparent. In fact, all attempts to loop the "Darning Needle" by a simple horizontal hand-launch failed.

#### Performance

The sketch at the lower right hand corner of the drawing shows how the model is held for launching. In this manner it is possible to hurl it straight up to an altitude of 100 feet. Once it reaches its maximum height, it immediately side slips out into a perfect glide. This effective method of starting the glide at an altitude is easily understood

if we will just drop the hushed model on its side. The excessively large fin area quickly pulls it out to a horizontal position. The dihedral angles on the planes help, of course, but doubtless their short span helps more by reducing the mass to be rotated.

In spite of the strange proportions of this model, we find the D.C. located as on others, namely .028 times the sum of span and length. This position of the directional center, or center of lateral area, also permits the nose of the model to swing down into a good gliding altitude after being momentarily stalled at the top of the flight path.

If we assume that the altitude of the record flight was, we'll say, eighty feet and that two seconds of the total of twenty-two were used up in climbing, we have the model descending eighty feet in twenty seconds, or four feet per second. This is only about equal to the sinking speed of the large primary gliders, which are of course not considered very efficient. Ted tells us that his best duration of this model was two minutes and fitty seconds at Van Cortlandt Park, New York. In this case rising currents were responsible.

If we were to try to improve the performance of this model, we would first work on bettering the gliding angle. This could be done by reducing the resistance. Instead of rough unfinished balsa fuselage and surfaces they could be carefully sanded and finished with dope or shellac. The size too could be stepped up to a span of twelve or fourteen inches When not flown in contests a sling of 1-8 inch rubber strand, fifteen or twenty feet long, could be used to project the model at high speed. The wings could be cemented to the fuselage, eliminating the rubber bands which have high drag. And finally, racing type, double cambered, elliptical surfaces without sweepback could be employed, which would reduce drag and which would have no appreciable center of pressure travel. This would permit mounting the front and rear planes at very closely the same incidence instead of a difference of about three degrees as on the "Darning Nee-

The basic idea has unlimited possibilities, and now that Ted has shown us how, who's going to be the first to make a full minute duration without the aid of rising currents?



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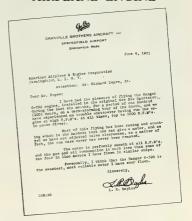
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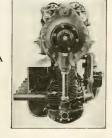
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### NATIONAL AIR RACES

(Continued from page 35)

part of the contesting pilot.

Various aeronautical organizations will hold meetings in conjunction with the National Air Races. Among the associations which have scheduled official gatherings at Cleveland during the races are the following: The Early Birds, banquet, Hotel Statler, September 1; Quiet Birdmen, banquet, Hotel Winton, September 2; Society of Automotive Engineers, National Aeronautic Meeting, Hotel Statler, September 1-3, banquet on the evening of September 3; Conference, Aeronautical Chamber of Commerce, September 1-2, and Annual Meeting of Fuels and Lubricants Section, Hotel Statler, September 4; and Engineers' Aviation Day, sponsored by A. S. M. E., at Cleveland Airport, September 4.

### CHOICE OF A WING SECTION

(Continued from page 47)

be avoided. Besides this rule, the exact amount of the travel does not influence the choice of the section. A little more or less does not make such difference, and even sections with fixed center have been used successfully because they possess other superiorities.

There remains then as a last consideration the performance. This is the main topic of most papers on the subject. This is the condition that has been attacked with square roots and odd powers of the coefficients and their combinations. We will see at once that such expressions are quite dispensable.

It is generally sufficient to assume that the span as well as the minimum speed of flying is prescribed. The former determines the induced drag and the designer should make up his mind from the beginning how much induced drag he is willing to admit, regardless of the choice of the wing section. Span and minimum speed determine then the wing area and hence the chord, if it be assumed for the present purpose that differences in the weight of different wings with the same span are negligible, and therefore not affected by the section. The area of the wings is then determined from the relation S=L/CL max. V2 min. p/2 where L denotes the total weight of the airplane. The wing area is equal to the total weight, divided by the maximum lift coefficient and by the dynamic pressure of the minimum flying speed. This area together with the span, determines the chord, or the mean chord c=S/b, or with a biplane, half of it. It follows that the spaciousness of wing sections should be compared in connection with the maximum lift (Continued on following page)

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(Continued from preceding page)

coefficient. Wing sections with a larger maximum lift coefficient are used with a smaller chord, and have therefore comparatively less space. We should therefore divide the available spar heights by the maximum lift coefficient of the section and compare the resulting lengths with each other, rather than the original available spar heights.

After having disposed of the maximum lift coefficient by a suitable size of the wing area, the performance is determined by the drag; to be more specific, by the profile drag, for the induced drag has nothing to do with the section. It is already determined by the choice of the span. Without the necessity of going into any mathematics, it is clear that speed as well as climbing and ceiling improves with a smaller drag. The only portion of the drag on which the wing section has some influence is the profile drag. The problem is therefore merely to select the wing section that gives the smallest profile drag, other things being equal. The profile drag is proportional to the profile drag coefficient and to the area, and this area is inverse to the maximum lift coefficient. It follows therefore, that the profile drag coefficient divided by the maximum lift coefficient presents itself as the most natural and direct criterion for the efficiency of the wing section. The designer has to choose a section with a small relative profile drag CD1/CL max., and he has to decide in which range of the lift coefficient small relative profile drag does the most good. That depends on the kind of performance he desires most to excel. The maximum speed takes place at about 18% to 28% of the maximum lift coefficient. Climbing and ceiling at about a half of the maximum lift coefficient. For a good overall performance, the relative profile drag should have a good value between these two points. With gliders, the climb and ceiling is the main requirement.

Caimo and ceiling is the main requirement. Having satisfied ourselves about the criterion for good efficiency it is easy to use it. A good diagram from comparing the different section is to plot the relative drag D/L max. against the relative lift. The usual polar curve makes almost any new diagram unnecessary, or the profile drag coefficient can directly be taken from it, and only the division by the maximum lift coefficient remains. Some authors prefer to plot the same relative profile drag against the so-called speed range, the ratio of the actual speed to the minimum speed V/V min. Since the speed is inverse to the square root of the lift coefficient, the speed range can be written V/V min= $\sqrt{C_L}$  max./ $C_L$ . The relative lift coefficient is inverse to the square of the speed range.

This relation seems too complicated for practical use. It is better to avoid the speed range altogether in this connection and to use the ratio of the lift coefficients.

The preceding discussion answers the question of how to select a wing section. It is simple and there are not involved steps necessary. There remain a few words to be said on how not to select a wing section. The problem is often improperly approached by mixing up the wing and the entire airplane. The air force coefficients of the wing are then subjected to computations proper for the coefficients of the whole airplane. The lift over drag ratio, L/D, or the expression  $C_D/C_L$  owe their use to this incorrect practice. The procedure leads to absurdity when applied to the profile drag only. It is, however, practiced with the induced drag included, generally for an aspect ratio 6, or with the aspect ratio that happened to be that of the wind tunnel model. The values obtained then make a better showing, but they offer a distorted picture and are not good for comparison, except in cases where the superiority of the one section is perfectly obvious. The



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(Continued from preceding page)

induced drag and the parasite drag of the airplane are in a variable ratio to the profile drag of its wings and are only known from case to case. Any arbitrary choice of such ratio for the purpose of comparison is open to criticism; an error is unavoidable. The relative drag compared at various values of the relative lift furnishes an entirely satisfactory criterion. This rule is simple, easy and sufficient, and there is none better.

The differences compared by it are rather delicate, and care must be exercised to determine whether or not the data available are really exact enough and dependable up to the small differences. As a rule, the same wing section gives slightly different results in different wind tunnels, or at different speeds. Wing sections should only be compared by testing them in the same wind tunnel under similar conditions. If possible the tests should be made within a short interval.

(This is the fifteenth of a series of articles by Dr. Max M. Munk. Copyright 1931. All rights reserved.)

### BURNELLI TYPE MONOPLANE

(Continued from page 50)

The analysis of the performance of these designs yields a drag coefficient of .00024 for the wing airfoil resistance; .00030 for the fuselage with cowled radial engine, and for low-wing, .00012 additional to the resistance of the fuselage for wing interference.

A comparison of the power area relations of a high-speed single-engined design with a Burnelli high-speed design is significant. (Table 5.) It is based on both planes having equal power load, landing speed, similar wing section and propeller tip speed with retractable landing gear and tail wheel. The Burnelli plane is provided with 40 per cent more tail area to support the outriggers extending from the short wing section fuselage. They add .6 square feet flat plate resistance, or .05 per 100 horsepower, which is neglected in the comparison to balance for the wing fuselage interference of the low-wing plane, which is .6 square feet flat plate or .14 square feet per 100 horsepowerengine power. This reduces the entire comparison to a consideration of the round streamline body and the airfoil section body with maximum fairing. The comparison is carried out in table 5, which particularly illustrates the capacity of the Burnelli plane. The comparison of the percentage of power required by the fuselage at 190 miles per hour, 28 per cent by the single-engined plane and 21 per cent by the Burnelli, indicates the greater speed possibilities of the latter. The following figures, which are based on established values, complete the comparison and give the relative high speed of both types:

| Round<br>Streamline<br>Single engine          | Wing<br>Fuselage<br>Burnelli |
|-----------------------------------------------|------------------------------|
| Flat plate resistance per horse-<br>power of: |                              |
| wing                                          | .00565                       |
|                                               | .00290                       |
| body                                          | .00088                       |
| outriggers                                    | .00050                       |
| fuselage wing interference00140               |                              |
|                                               |                              |
| Total                                         | .00993                       |
| High speed 204 m.p.h                          | 216 m.p.h.                   |

Investigation of the figures referred to in this treatise gives evidence that the all-wing plane of the Burnelli type (Continued on following page)



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### THE WORLD'S NEW CROSSROADS

(Continued from page 40)

planted them. But the wild-goose chases of the recordbreakers have also done their share to upset the world's geography and draw new lines of communication over the waste places of the earth.

This is the true pioneering of this age of far flights. Not the flights themselves, but the creation of airways on a world scale. The choice of routes, the selection of bases, the elimination of uncertainties in spanning big distances over bad country. One plane goes through and another follows and profits by all that the first flight discovered. And at last, perhaps, a commercial service is flying where once a record-breaker chased a headline and a vaudeville contract.

The result is that the world grows accustomed to a new sort of crossroads for its traffic. All the commerce and industry in history have been determined along highways and civilization has followed them. Once they were trails beaten down into the earth, avoiding dangers and difficulties, keeping in touch with water and choosing the easiest way. Some of them lasted a long time; there are roadways in Asia today on which traffic has moved for three thousand years. The great cities of old were at the crossroads of these weary highways.

And then commerce went to sea and all long journeys ended in seaports. Canals were cut through the land and created new nations. Two of them today direct the course of half the world's business. Wealth followed the waterways and the world's crossroads became the cities where the rails and highways meet the ocean trails.

And now a new means of transportation disputes all the old geography and makes crossroads of its own. Nobody knows yet where they will finally lie. Very likely there will be some far in the frozen North, where mail and passenger planes will go over the earth between the continents. Lonely islands in the open ocean will be busy with air traffic; nations will squabble for them and sometimes fight for them. Tiny villages will become cities, and rough places will be made smooth for landing wheels. And the maps will need to be made over again and all geography must be modernized. It is happening now, in some small degree. There are lots of schoolboys who could put their finger on Baker Lake and Point Barrow and Tokio today, who have no idea where Thebes and Athens and Alexandria once stood in all their ancient glory. And that is because the flying Lindberghs went look for a new Northwest Passage, laying a course which commerce may some day follow by way of a chain of airports, landing fields and busy crossroads of air traffic.

The round-the-world fliers, I maintain, deserve their place in history not because their motors behaved very beautifully for 116 hours and 34 minutes, nor because they were able to keep on good terms with each other for nine days of exhausting propinquity. Not even for a fine feat of navigation, the credit for which they must share with their instrument board. But because they planned a course around the world and proved it could be flown quickly. They are path-makers as well as pace-makers. So are the Lindberghs on their more leisurely way westward. So was Parker Cramer, though he failed to get through. Others will follow and find the fastest, safest highway

(Continued on following page)

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(Continued from preceding page)

across the shoulder of the world from America to Europe. It is the same sort of work that was done in the 16th Centurry by the pioneers of the ocean trails. They sailed away to find plunder or lands of easy living or because home was too hot to hold them any longer. They tried to get around the North of Europe and through the ice beyond Canada. They went around Africa to India, where gold was supposed to grow on trees and the gravel might be full of diamonds. They hunted the Fountain of Youth in Central America and sailed around Cape Horn to seek the Los Islands where every day was Sunday. The tougher the trip, the more likely it seemed to old adventurers that the pickings would be plentiful at the end of it.

And they thought very little, if at all, of the ocean tramps, the oil tankers, the coal carriers, the lumber boats and the luxurious liners that would some day follow their trails. But they picked their ports for them, discovered the deep sea lanes, mapped the world's oceans and everywhere opened up the sea to the commerce that came after. That is the real service of the pioneer planes that are aloft today in the most unlikely places on the face of the earth They may be going nowhere in particular for no good reason, but if they get through the carriers of commerce will some day follow the same route.

It seems to need a flock of failures to set the scene for success. That also has been true before, for there were many brave ships that went away in the age of exploration and never came back. There were many covered wagons that collapsed beside the trail before there was a safe road into our own West country. But an encouraging sign in a year that has not been too cheerful is the fact that the chances seem to have shifted over to the side of the pilot who sets out for Europe or elsewhere. The chances are that he will get somewhere in safety, even if he doesn't hit his home town right on the nose. The pessimists are asking odds today, when an airplane undertakes to accomplish the impossible.

Although the depression may still be with us, bless its lingering ways, there are things to be thankful for. One is that this year has seen a real triumph for aviation over some of its most obstinate enemies. They are distance, the forced landing, the open sea, the luck of weather, and the lack of a place to go. The flights of Post and Gatty, Herndon and Pangborn, Boardman and Polando, Hillig and Hoiriis, Magyar and Endres, have handed quite a licking to these jinxes and it looks as though it will stick. But they have done a deal more than that, for they have helped to widen the scope and scale of practical aviation to dimensions which seemed not long ago to be far beyond our reasonable expectations. So have those other flights which have crossed the African continent and the wide seas to Australia. So have those which have skirted the arctic ice Eastward and Westward. So have the trail-makers in tropical lands, which are now become the most difficult of flying country.

The fuss that the public makes over the long-distance flights is mistaken in its emphasis and sometimes absurd in its extravagance. The enthusiasm of the by-standers misses the point. The radio announcers talk a lot of rubbish and the after-dinner oratory that follows t he flight is hard to bear. But big things have been done this year by the argonauts of the air, who have laid out a new network of transportation over land and sea. They have put on the map the crossroads of the future, and monuments may some day stand there to their illustrious memory.

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is finer than Racon! Whether or not you are satisfied with your present sound, there is room for improvement. Let us solve your problem!



Racon horns and units are covered by U. S. Patents Nos. 1,507,711, 1,501,032, 1,577,270, 73,217, 73,218, 1,722,448, 1,711,514, 1,781,489.

### RACON

ELECTRIC CO., INC. 18 Washington Place, New York ENGLAND and CANADA



9-UNIT AEROPLANE HORN

### SELECTED CLEAR AERO

We have been specializing in high grade spruce for many years. All of our spruce aero stock is selected, manufactured and packed with utmost care and shipped promptly.

LOWEST WHOLESALE PRICES

SAMPLES OF OUR PRICES Lengths, asserted or specified, up to 16'

|                             | Price pe | r foot |
|-----------------------------|----------|--------|
| 3/16x5/16, 1/4x1/4, 5/16x5  |          |        |
| /4x1/2, 5/16x1/2, 3/8x3/8   |          | .02    |
| 1/4x3/4, 3/8x1/2, 1/2x1/2.  |          | .021/2 |
| 3/8x3/4, 5/8x1/2, 1/4x7/8.  |          | .03    |
| 5/8x5/8, 1/4x1, 1/2x3/4     |          | .031/2 |
| 1/2x1, 5/8x3/4, 3/4x3/4     |          | .84    |
| 5/8x1, 3/4x1, 7/8x7/8       |          | .041/2 |
| 7/8x1, 3/4x1-1/8, 5/8x1-1/  | 4        | .05    |
| ixi, 3/4xi-1/4, 1/2xi-5/8   |          | .051/2 |
| 1x1-1/4, 3/4x1-1/2, 1/2x1-3 | 3/4      | .06    |
|                             |          |        |

HERE ARE QUOTATIONS FROM CUSTOMERS' LETTERS

Ship me via express 160 feet air-craft spruce in 5-foot lengths. The last order received from you was wonderful material. Will endeavor to send you a large order soon.— Chas. M. Snyder, Lockport, Ill.

We enclose money order for \$10.40 to cover material as quoted in your letter attached. We have had two previous shipments of airplane spruce from you and are service.—Tyler Howell, Jonesville, Mich.

The spruce I ordered from you last week has been received and am well satisfied. At your earliest convenience please quote me lowest price on attached list.—Wallace W. Stubbs, Milwaukee, Wis.

I want to compliment you on the service that we received. I had a party ask me today where he could party ask me today where he would be a summer to the service of the ser

Send detailed list of exact finished sizes desired.

### THE PIKE DIAL LUMBER CO.

2265 LOOMIS ST., CHICAGO



A COMPLETE

### GLIDER SERVICE

from the primary "Rhon Ranger" to the latest soarer, "Challenger C-3". Safety, performance and beauty are outstanding qualities of MEAD ships; they are easy to build and easy to fly; they are known and flown the world over.



"Rhon Ranger": Complete Construction Kit. \$89.50 or in six shipments averaging \$15.00 each "Challenger Streamline Kit" (converts the "Rhon

Ranger") ...... \$44.00 "Challenger C-I": Complete Kit......\$131.00 or in six shipments averaging \$22.00 each

We carry a large stock of aircraft materials of all kinds. Send 10c today for catalogs and descriptions of our ships

MEAD GLIDERS

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Chicago, Ill.

## BOOKS ON AERONAUTICS

| SOCOCOOCONCONCONCONCONCONCONCONCONCONCONC                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              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| 20 HRS. 40 MIN. Amelia Earhart. \$2.50 AIR, MEN AND VINUS. Gilman. \$3.50 ANDREES SICHY. Exist by the Swedish Society for Anthropology and Geography. \$5.00 ACMOUND THE WORLD IN 28 DAYS. AVIATION IN FEACE AND WAR. \$3.50 AVIATION IN FEACE AND WAR. \$3.20 ACMOUND THE WORLD IN \$5.20 ACMOUND TO THE AIR. \$1.20 CONQUEST OF THE AIR. \$1.20 CONQUEST OF THE AIR. \$1.75 FIERDAM FORMS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | FOR SALE BY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | JAPAN, THE AIR MENACE OF THE PACIFIC. W. Jefferson Davis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| AIR, MEN AND WINGS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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                                                                                                                                                                    | KNIGHTS OF THE AIR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| ANDREE'S STURY. Edited by the Swedish So-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | AERO DIGEST                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Lieut, Lester J. Massland                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| AROUND THE WORLD IN 28 DAYS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | BOOK DEPARTMENT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Eric Hodgins and F. Alexander Mogoun. \$2.50<br>THE WORLD'S WINGS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| AVIATION IN PEACE AND WAR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | THE WORLD'S WINGS. W. Jefferson Davis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| CONQUERING THE AIR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | ELEMENTARY (General)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | W. Jefferson Davis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Archibald Williams\$2 CONQUEST OF THE AIR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ELEMENTARY (General)  A B C OF AVIATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | INSTRUMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        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| C. L. M. Brown\$1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | A B C OF FLIGHT. Lawrence LePage\$1.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | AIRCRAFT INSTRUMENTS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Fitzhugh Green                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Major V. W. Pagecloth, \$2; paper \$1.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | H. N. Eaton and Other Specialists                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| FALCONS OF FRANCE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | AN ELEMENTARY COURSE IN GLIDER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | LANDING FIELDS AND AIRWAYS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         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| FIGHTING THE FLYING CIRCUS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | FLYING (set of five) Capt. Arthur La Roe.\$1.50<br>BOOK OF THE AEROPLANE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | AIRPORTS AND AIRWAYS. Donald Duke \$5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| FLYING THE ARCTIC.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Capt. J. Laurence Pritchard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | LEGAL AND MEDICAL                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| Captain George H. Wilkins                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | S. Vanier (German, English and French).\$1.65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | AERONAUTICAL LAW.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| INDIA BY AIR. Sir Samuel House\$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Virginius Evans Clark\$3 ELEMENTARY AERONAUTICS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | W. Jefferson Davis \$16 AIRCRAFT AND COMMERCE IN WAR James M. Spaight \$2.2: AIRCRAFT LAW—MADE PLAIN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Lieut. Barrett Studley\$2.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Albert P. Thurston, D. S                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | AIRCRAFT LAW-MADE PLAIN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| PILOTS' LUCK.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | J. B. Hart and W. Laidler                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | AIR POWER AND WAR RIGHTS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| stories by Elliott White Springs; Capt. A. Roy                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | ELEMENTARY LABORATORY AERODY-<br>NAMICS. Arthur L. Jordon                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | AVIATION LAW. Henry G. Hotchkiss \$7.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| DICK BY BD—AIR EXPLORER.  FIRTHING POST.  FIRTHING THE STATEMENT OF THE ST                                                                       | EVERYBODY'S AVIATION GUIDE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | AIR POWER AND WAR KIGHTS.  N. M. D. Spendal W. Horry C. Heichbits. 12.5  LAW OF AVIATION. Routland W. First. 17.5  LAW OF THE AIR. Carl Collingua.  THE LAW IN THE AIR. Carl Collingua.  Spark, W.C.  U. S. AVIATION REPORTS. 41  AVIATION MEDICINE. 27.5  15.56                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| RECORD FLIGHTS.  Clarence D Chamberlin\$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | THE LAW IN RELATION TO AIRCRAFT  L. A. Wingfield, M.C., D.F.C., and R. B                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| SAILING THE SKIES. Malcolm Ross\$2.50<br>SKYWARD. Commander Richard E. Byrd.,\$3.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | GLIDERS AND GLIDING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Sparks, M.C.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| SPEED. Frank M. Hawks\$2.50 STRATEGY AND TACTICS OF AIR FIGHT-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | HOW TO FLY, Barrett Studiey\$3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | AVIATION MEDICINE.  Louis H. Bauer, M.D. \$7.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| RECORD FLIGHTS.  Clarence D. Chamberlin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Orolle Kneen \$3.50 CIDIERS AND GLIDING. \$3.00 HOW TO FLY. Barret Studies \$3.00 HOW TO FLY. Barret Studies \$3 HOW TO FLY AN AIRPLANE.  Percual White \$5 F YOU WANT TO FLY. \$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| AIR. Charles Dixon. \$2.50 THE FIRST WORLD FLIGHT. As related to Lowell Thomas by the fiver themselves. \$5 THE FLYING DUTCHMAN. A. H. G. Fokker and Bruce Gould. \$3.00 THE OLD FLYING DAYS. \$7 Motor C. Turrere. \$7 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Alexander Klemin\$2.50                                                                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| Lowell Thomas by the flyers themselves\$5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | MANUAL OF FLIGHT. Isnar E. Elm\$3<br>MODERN AIRCRAFT. Major V. W. Page\$5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | METALLURGY OF ALUMINUM AND ALU                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| A. H. G. Fokker and Bruce Gould\$3.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | MODERN AIRPLANE. Bertram W. Downs\$1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | MINUM ALLOYS. Robert J. Anderson\$1<br>ENGINEERING MATERIALS (VOL. II)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| THE OLD FLYING DAYS.  Major C. C. Turner                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | IF YOU WANT TO FLY. \$2.50 Alexander Kimin HT. rear E. Elm \$3 MODERN AIRCRAFT. Major V. W. Page \$3 MODERN AIRCRAFT. Major V. W. Page \$3 MODERN FLICHT. Exper Priram W. Domas \$3 MODERN FLICHT. Exper Priram W. Domas \$3 Experiment Studies, U. N. N \$5 FRACTICAL FLYING. Bryon Q. Jones \$3 SIMPLIFIED AERODYNAMICS. \$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | MANUFACTURE AND USE OF PLYWOOD AND GIVE AND USE OF PLYWOOD AND GIVE AND GIV |
| THE RED KNIGHT OF GERMANY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | PRACTICAL FLYING. Byron Q. Jones\$3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Non-Ferrous and Organic Materials.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Floyd Gibbons                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Alexander Klemin\$3.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | ENGINEERING MATERIALS (VOL. III                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Lt. D. W. "Tommy" Tomlinson\$3.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | SKYCRAFT. Augustus Post                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | A. W. Judge                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| THE OLD FLYING DAYS. \$7.50  Major C. Farner. \$7.50  Major C. Farner. \$7.50  The story of Beron Von Richhoten. \$1  THE SKY'S THE LIMIT. \$1.50  THE THREE MUSKITEKEN. \$7.50  THE THREE MAJOR Firmmarice and Grown  won Hemsteld. 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Alexander Klemin . \$3.50  KYCRAFT. Augustus Post. \$3.50  KYWAYS. General William Mitchell . \$3.30  SKYWAYS. General William Mitchell . \$3.51  THE AEROPLANE S'FEAKS. H. Berber . \$3.50  THE ARPLANE. Frederick Bedell . \$3  THE ART OF FLYING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | METEOROLOGY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| THE WAR IN THE AIR. (3 vols.)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | THE AIRPLANE. Frederick Bedell\$3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | edition). W. R. Gregg                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
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A. \$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| BOAT. Sir Alan J Cobham\$2,50 WINGS OF TOMORROW.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | AIPLANE STEES ANALYSIS.  ### AIRCOMMENTS OF AEROFOIL AND AIR SCREW THEORY. H. Guestr. DVN. 48.60 FUNDAMENTALS FOR FULUS DVN. 48.60 FUNDAMENTALS FOR FULUS DVN. 48.60 FUNDAMENTALS FOR FULUS DVN. 48.60 FUNDAMENTALS AREOLYNAMICS AND THE 41.60 FUNDAMENTALS AND FUNDAMENTALS AN | FORCE OF THE WIND. Herbert Chatley S.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| Juan de la Cierra and Don Rose\$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | ELEMENTS OF AEROFOIL AND AIR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     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| Joseph Lewis French\$1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | SCREW THEORY. H. Glauert\$5.60 FUNDAMENTALS FOR FLUID DYNAMICS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | WEATHER. E. E. Free and Travis Hohe \$                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| NAVIGATION AFRIAL NAVIGATION & METEOROLOGY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | FOR AIRCRAFT DESIGNERS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | WEATHER AND WHY. Captain Ienar E. Elm\$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| AERIAL NAVIGATION & METEOROLOGY. Lutis A. Yencry (new edition). AIR NAVIGATION AND METEROLOGY. AVIGATION AND METEROLOGY. AVIGATION BY DEAD RECKONING. Captan I near E. Elm. Least-Com. P. J. H. Weens                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    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| Capt. Richard Duncan, M. 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Merrill Hamburg. \$2.5. BUILDING AND FLYING MODEL AIRCRAFT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Captain lenar E. Elm                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Paul Edward Garber. \$2.2 MINIATURE AIRCRAFT, HOW TO MAKI AND FLY THEM. Omar H. Day and Terence Vincent80                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| LieutCom. P. V. H. Weems\$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | AEROPLANE ENGINES IN THEORY AND PRACTICE. J. B. Rathbun                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | AND FLY THEM.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| SIMPLIFIED TIME-CHART OF THE WORLD.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | A. L. Dyke OWER PLANTS. B. T. Jones. R. Insley, F. W. Caldwell and R. F. Kohr. \$4.25 AVIATION ENGINE EXAMINER.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | PARACHUTES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Chas. M. Thomas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | R. Insley, F. W. Caldwell and R. F. Kohr. \$4.25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | JUMP. Don Glassman                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
| Lieut. Com. P. V. H. Waems                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | R. Isalev, F. W. Caldwell and R. F. Koiv, \$4.25 AVIATION ENGINE EXAMINER, Major V. W. Page. AUTOMOBILE AND AIRCRAFT ENGINES, A. W. Judge AVIATION CHART. Lt. V. W. Page. AVIATION CHART. Lt. V. W. Page. DEOK. A. M. R. CHART. LT. W. P. Page. MODERN AVIATION ENGINES, Victor W. Page (2 columnas), per columna\$5 Set of 2 volumnas\$5 Set of 2 volumnas\$5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | milemonn i milli                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| THE NAVIGATION OF THE AIR AND METEOROLOGY. Capt. Leslie Potter\$4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | A. W. Judge(Revised) \$10                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | AERIAL PHOTOGRAPHS. Limi. Dache M. Reeves, A.C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| METEOROLOGY. Capt. Leslie Potter\$4                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | DIESEL AND OIL ENGINEERING HAND.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Lieut. Dache M. Reeves, A.C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
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(Continued from page 45)

had proved itself an essential part of his plane equipmentalmost as valuable as his compass. It certainly increased the value of his plane. He is able to take longer crosscountry flights with surety and feel safer on arriving over his selected airport. He has conceded the value of receiving equipment. By why any transmitting equipment?

Let us assume that a pilot starts out on a business trip to Akron, Ohio. It is essential that he get there at a specified time to keep a business appointment. It is necessary that he avail himself of the last minute possible before leaving New York for business in that city. Flying is the solution to his problem. He leaves under reasonably good weather conditions but suddenly along the route he runs into thick weather. The beacon receiver tells him that he is on the course, so he climbs until he clears the fog. Nothing is visible below except the fog. He is still flying on the beacon course and is sailing serenely along until suddenly there are a couple of misses from the motor that make him wonder whether the operator filled his tank as he was ordered to before the pilot took off. He should have checked it himself he muses, but he was in such a hurry. Where is he anyhow? Out comes his map and he figures roughly from his flying speed and length of time since departure that he should be about over Blankville. He crawls down a bit but the fog is thick. He turns to his radio telephone transmitter and starts calling, "This is NX-710 flying about 3,000 feet approximately over Blankville as nearly as I can figure, but I am not positive."

He has tuned his receiver from the Department of Commerce beacon frequency to the 278 kilocycle, tuning by a simple turn of the dial, and he listens. Very shortly after his call he hears, "Calling NX-710. This is Oakwin Airport. We just heard you passing over us. Would judge that you are ten miles northwest. Suggest that you turn back and land. Visibility at airport 500 feet."

Again, as easily as though he were picking up his tele-phone at the office, he replies "NX-710 replying. Thank you, Oakwin Airport. Am turning back and will land.

Can you service me with gas? How do your runways run?"
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Even in clear weather the radio is useful to the flier landing at a strange airport. By simple telephone conversation he can, when in doubt, establish the identity of an airport, as well as secure information useful in making a landing.

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The plane sat on the beach for approximately 30 days throughout the three attempts in rain, wind and selt air, and from all appearances it is as good as the day it came out of the abop.

With best personal regards from Fred and myself, we are

Sincerely.

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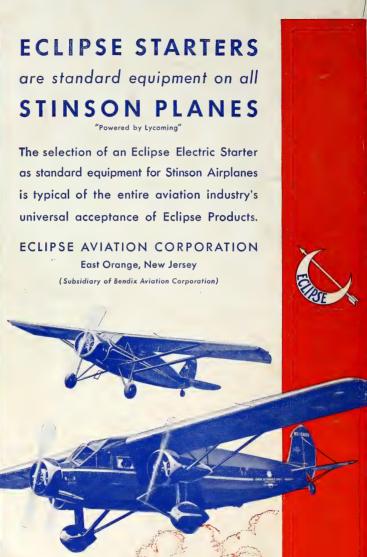
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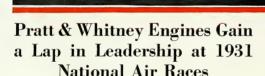
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Climaxing a series of performances that brought new honors to Pratt & Whitney at Cleveland, Was pengines swept home with both winner and runner-up in the Thompson Trophy Race. Lowell Bayles in his Wasp Junior - powered Gee Bee averaged 236:239 m.p.h.—a second consecutive victory for the Wasp Junior in America's greatest speed classic. Following him closely came J. R. Wedell in a Wedell-Williams—also equipped with a Wasp Junior

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hrs., 16 min., 10 sec. Likewise, in the Women's Free-For-All Classic, Wasp power captured 1st and 2nd places, Maude-Irving Tait in a Wasp Gee Bee Senior Sport led Mae Haizlip flying a Wasp Junior Laird. These are but a few of the outstanding events of this year's races in which Wasp scored significant triumphs.

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Lowell R. Bayles and the Wasp Junior that helped him capture the Thompson Trophy

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# Wholly changing public opinion of AIR TRAVEL

A FULL REALIZATION of the potentialities of the Autogiro to the general public and the aviation industry can come only from actual knowledge of Autogiro flight.

Here is part of what Ben Ray Redman writes in a review of the book "Wings of Tomorrow" in the New York Times, June 28th, 1931:

"One morning last winter, standing on the Pitcairn aerodrome near Philadelphia, I watched James Ray take a flying machine into the air and make it do things that I knew no airplane could do. As he took off slowly, nose up and tail down, I knew he was going to crash; when he drifted over our heads at a speed of about twenty-five miles an hour, I felt a little sick, for a stall at that height was bound to be fatal; while he crawled around the turns, I looked away to avoid seeing him slip into a spin; and when he began to sink almost vertically towards the earth, I could only hope that an ambulance would be on the spot when he struck. But he neither stalled, spun nor crashed; and, as he settled lightly as a gull, with almost no forward speed at all, I found myself echoing the old protest: There ain't no such animal.

"I was wrong, of course. There is; and it is not, strictly speaking, an airplane. It is the Autogiro, invented by Juan de la Cierva, and it is the nearest thing to a fool-proof flying machine that has yet been built by man . . . Those long rotor-blades that you may have seen whirling in the sky, and that suggest a helicopter in their motion, are really driven by no power except that of the air itself; but as they turn, guided by air currents and obeying their own aerodynamic laws, they form a lifting surface that replaces the rigid wings of the ordinary airplane. They are, indeed, the "wings" of the Autogiro, for it is on them that this new machine flies, but they are free, flexible wings, quick to adapt themselves to the requirements of different speeds and different positions; and it is this new adaptability that makes the Autogiro safe, sound, and almost fool-proof . . .

This expression of enthusiasm typifies the wholly changed attitude toward air travel that results from experience with the Autogiro.

The Autogiro Company of America is not a manufacturing or selling company. It is solely an engineering and licensing organization. It owns and controls, exclusively, all Autogiro patent rights in the United States. Manufacturing companies of high standing will be licensed to build Autogiros with the full cooperation of our engineering staff.

Present licensees are: Buhl Aircraft Company, Detroit, Mich. . . . Kellett Aircraft Corp., Philadelphia, Pa. . . . Pitcairn Aircraft, Inc., Willow Grove, Pa.

Characteristics

The Autogiro differs basically from all other heavier-than-air craft in the source of its lifting capacity. This lift is given primarily by four rotating blades which take the place of the

The Autogiro differs basically from all other heavier-than-air craft in the source of its lifting capacity. This lift is given primarily by four rotating blades which take the place of the familiar wings of an airplane. There is not time when this supporting rotation of the blades can be stopped while the control of the blades can be stopped while the control of the blades can be at the control of the blades of the blades is produced solely by the different caused by the movement of the Autogiro in any direction, climbing, level flight, glidding or descending vertically. The supporting rotation of the blades is entirely independent of the engine, whose sole function is to propel the Autogiro.

The Autogito presents flying characteristics hitherto impossible. It can take off at low speed after a very short, run, and immediately assume a steep-climbing angle. It can fly well over too miles per hour: or as slowly as 25 miles per hour. It can be brought momentarily to a standstill and hover. It can hank and turn slowly without fear of loss of forward speed, it can glide or descend vertically at a speed as a parachute, and with virtually no forward speed even with a dead engine. Above all, it cannot fall off into a spin from a stall. As a result, little operating skill is required.



Burnelli 20-passenger Transport, equipped with retractable landing gear

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WITH INCREASED SAFETY, COMFORT AND CARGO SPACE

HE BURNELLI TRANSPORT is not just another airplane. Its development over a period of years has proved a new trend of design for multi-engined airplane advancement. If The Burnelli principle heretofore demonstrated in large capacity planes applies equally advantageously to planes of smaller design to meet the present demand of air transportation for higher speed with more frequent service. If It combines the high speed qualities of the single engined airplane with the increased size and greater power reliability of the multi-motor plane.

THE following fuselage comparison of the Burnelli type with a high speed single-engined design demonstrates the advantages of the Burnelli type as a high speed passenger and express carrier. Both planes in the following comparison carry equal load per horsepower, use the same wing section, have the same landing speed, equal propeller tip speed and each is equipped with retractable landing gear and tail wheel.

|                                            | HIGH SPEED | BURNELLI |
|--------------------------------------------|------------|----------|
|                                            | SINGLE     | TWIN     |
|                                            |            | ENGINE   |
|                                            | ENGINE     | ENGINE   |
| Horsepower                                 | . 425      | 1.200    |
| Gross weight                               |            | 13,300   |
| F 11 ff 1                                  |            | 50       |
| Frontal area of fuselage, square feet      |            |          |
| H.P. per square foot of frontal area       |            | 24       |
| Cargo space, cubic feet                    | . 135      | 550      |
| H.P. per cubic foot of cargo space         |            | 2.12     |
| Drag coefficient of body ideally faired    |            | .00022   |
|                                            |            | .00030   |
| Engine with cooling system                 |            |          |
| Lift coefficient of body                   | . 0        | .0020    |
| Equivalent wing area saving, square feet   |            | 140      |
| Equivalent resistance saving flat plate    |            | 1.22     |
| Resulting comparative body resistance pe   |            |          |
|                                            |            | .290     |
| 100 H.P. equivalent flat plate             | 305        | .290     |
| Percentage of engine power required by boo | ly         |          |
| at 190 m.p.h                               |            | 21%      |
| Engine power required at 190 m.p.h. per 10 |            | ,•       |
|                                            |            | 46       |
| cubic feet of cargo space                  | . 88       | 40       |

The aerodynamic advance of this design is due to the following, as set forth and extracted from wind tunnel research report of the Guggenheim School of Aeronautics, New York University.

- (1) The use of airfoil shaped body while providing large internal space contributes substantially to the lift.
- (2) The body being of airfoil form has a very low drag coefficient.
- (3) The high wing monoplane gives the most efficient wing and body combination.
- (4) The design allows for retraction of the landing gear together with a high wing and body combination.
- (5) The design permits the use of twin engine installation without penalty in additional frontal area.

### PRACTICAL ADVANTAGES

- Accessible Multiple Engine Compartment, allowing inspection and minor repairs during flight.
- Extensive Reduction of Head Resistance, necessary to high performance.
- Reduced Turning Moment on One Engine, assisting flight with one motor operating.
- Fuselage Lift Reduces Landing Speed, valuable for slower and safer landings.
- Increased Capacity of Fuselage, maximum space for comfort and light cargo.
- Practical Landing Gear Retraction, greater future aerodynamic efficiency.
- Superior Safety in Operation. Protection afforded by engines and propellers being well forward of pilot's and passenger cabin.
- 8. Structural Efficiency and Simplicity. Stresses of engines, propellers and landing gear bear no relation to wing
- Convertible to Seaplane or Amphibion. The wide fuselage permits efficient twin float attachment interchangeable with landing gear.

Details of the Burnelli Transport and High Speed types will be sent on request.

A portion of the interior of the Burnelli Transport showing seating arrangement. Patented fuse-lage design provides a spacious and comfortable cabin.



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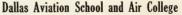
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FAIRFAX AIRPORT KANSAS CITY, KANSAS

### PERFORMANCE

| Take-off  |        |  |  |  |  |  |  | ÷ |  |  |  |    | 7   | s | ec |  |
|-----------|--------|--|--|--|--|--|--|---|--|--|--|----|-----|---|----|--|
| Landing   |        |  |  |  |  |  |  |   |  |  |  |    |     |   |    |  |
| Climb     |        |  |  |  |  |  |  |   |  |  |  |    |     |   |    |  |
| Top spee  |        |  |  |  |  |  |  |   |  |  |  |    |     |   |    |  |
| Cruising  |        |  |  |  |  |  |  |   |  |  |  |    |     |   |    |  |
| Cruising  |        |  |  |  |  |  |  |   |  |  |  |    |     |   |    |  |
| Absolute  |        |  |  |  |  |  |  |   |  |  |  |    |     |   |    |  |
| Service c | eiling |  |  |  |  |  |  |   |  |  |  | 14 | ,00 | 0 | ft |  |

### DIMENSIONS

| Length  | overal | I     |   |  | 21 ft. 71/4 in. |
|---------|--------|-------|---|--|-----------------|
| Span    |        |       |   |  | 34 ft. 4 in.    |
| Height  |        |       |   |  | 93 in.          |
| Surface | area,  | total |   |  | 164.4 sq. ft.   |
|         |        |       |   |  | 412 lbs.        |
|         |        |       |   |  | to this total)  |
| Weight  | empty  |       |   |  | 500 lbs.        |
| Landing | gear   | tread | i |  | 65 in.          |
|         |        |       |   |  |                 |

### STANDARD EQUIPMENT

Dual controls, quickly removable. Chrome yellow wings and blue fuselage. Altimeter, tachometer, switch, gas shutoff, Fahrenheit gauge, oil pressure gauge, gasoline gauge, spark control. Capacity for 10½ gallons of gasoline and 5 quarts of oil. Wood propeller, metal tipped. Pyrene, first aid kit, log book, 2 safety belts, 2 seat cushions, windshield.

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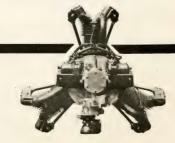
### Specifications:

| _                                                                                                                              |
|--------------------------------------------------------------------------------------------------------------------------------|
| Bore                                                                                                                           |
| Stroke4 in.                                                                                                                    |
| Piston displacement                                                                                                            |
| Compression volume ratio 5 to 1                                                                                                |
| R.P.M2125                                                                                                                      |
| H.P50                                                                                                                          |
| Weight without hub                                                                                                             |
| Weight per h.p 2.5 lbs.                                                                                                        |
| Total account to an interest of a second                                                                                       |
| Fuel consumption-cruising, actual, 2 to                                                                                        |
| 2½ gals. per hr., 30 to 40 miles per gal.                                                                                      |
|                                                                                                                                |
| 21/2 gals. per hr., 30 to 40 miles per gal.                                                                                    |
| 2½ gals. per hr., 30 to 40 miles per gal.<br>Oil consumption—½ pt. per hr.; 1400 to                                            |
| 2½ gals. per hr., 30 to 40 miles per gal.<br>Oil consumption—½ pt. per hr.; 1400 to<br>1500 miles per gal.                     |
| 2½ gals. per hr., 30 to 40 miles per gal.<br>Oil consumption—½ pt. per hr.; 1400 to<br>1500 miles per gal.<br>Overall diameter |
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| 2½ gals. per hr., 30 to 40 miles per gal. Oil consumption—½ pt. per hr.; 1400 to 1500 miles per gal. Overall diameter          |
| 2½ gals. per hr., 30 to 40 miles per gal. Oil consumption—½ pr. per hr.; 1400 to 1500 miles per gal. Overall diameter          |

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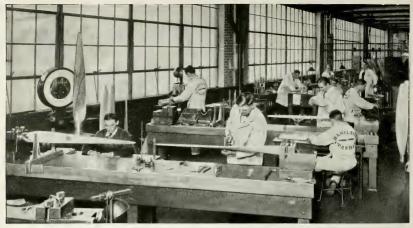
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Section 10-AD

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Reproduced above is an aerial view of the modern plant of the Sikorsky Aviation Corporation, at Bridgeport, Connecticut

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In 1910 Igor Sikorsky had the extreme satisfaction of test-flying his first plane, the S-1. During the 21 years which followed that successful initiation Sikorsky designs have shown a fine combination of genius with advanced aeronautical engineering. The application of this combination to the most modern of manufacturing methods has resulted in the use of the name "Sikorsky" as a synonym for the highest type of amphibion airplane.

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plete Experimental Laboratory for research into and the proving of various elements of aircraft design and manufacture. An essential feature of this aeronautical laboratory is the Vertical Wind Tunnel—the first of its type in the United States.

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SIKORSKY AMPHIBION

WORLD'S RECORD FOR ALTITUDE WITH LOAD OCTOBER, 1931



OIL COMPANY . LOS ANGELES . NEW YORK CITY



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W-312



An actual reproduction of the clock dial card of the Newhamco seaplane on which the actual flying time is automatically recorded. The dark markings on the edge of the dial are made when the engine is speeded up—with intervals between when the plane is at rest.

... STEADY PROFITS!

O'N a quiet, mid-week day, Wednesday, August 19th,
Vice-President Bob Fogg and Mechanic "Chuck"

Kent, of Newhamco Air Service, boarded one of their EDOequipped Waco seaplanes at their base on Lake Winnedependence

FOR READY SERVICE

a half-hour flight to Post Mills on Lake Fairlee, Vermont. From the time of their arrival until 7:42 in the afternoon, with only time out for refuelling, Pilot Fogg made 51 Royands six-minute flights and carried 102 passengers at \$3.00 apiece. At 8:12 the seaplane was back at its home base.

pesaukee, New Hampshire. Starting at 10:50, they made

In one day of 5 hours and 43 minutes of actual flying time, as shown on the automatic log, this enterprising air service had earned \$306.00!

This is a typical example of the splendid business oppor-

NOW AUTOMATIC WATER-RUDDERS FOR EDO FLOATS tunities that are opened to air service operators who have their planes equipped with EDO Floats. No waiting at the field till week-end visitors arrive—less competition—no dependence on nor rental for flying fields as a temporary base of operations. With EDO Floats, pilots fly to their market in hundreds of cities and towns bordering the waterways. 1931 has been a successful year for seaplane operators. Ready service and steady profits will be the reward of those who prepare now for 1932 with EDO's.

EDO All-metal Floats, standardized in 15 sizes with complete installation interchangeable with wheel landing gear, are licensed for practically every well known make of land plane. Let us give you complete details of EDO equipment and individual, interested service. Address, EDO Aircraft Corporation, 610 Second St., College Point, Long Island, N.Y.



OCTOBER, 1931



# Every one of the 88 Curtiss-Wright Service Stations can supply everything from a wing to a washer

By providing the only extensive National network of complete service stations, Curtiss-Wright takes the final step in assuring owners of Curtiss-Wright planes the continued excellent performance originally built into the plane. Even the finest automobile requires occasional expert attention. From coast to coast, no Curtiss-Wright owner is ever more than 3 hours from complete engine and plane service. Adequate stocks of spare parts are carried at each Curtiss-Wright Service Station.

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# VICTOR AGAIN

#### 114 HOURS from Coast - to - Coast with DOOLITTLE in the LAIRD "400"

MAJOR DOOLITTLE who flew the Laird "400" to victory in two important events -the Bendix Trophy and Trans-continental Races. One of the contry's best-liked pilots, "Jimmy" is now King of Speed.

#### DISTRIBUTORS:

Exclusive territories available for established firms with funds and suitable demonstration facilities to handle LAIRD sales. To the proper parties we will extend every factory, sales and delivery cooperation.

N September 4th, eight pilots warmed up their eight powerful planes at Burbank Airport, Los Angeles, for the swift dash to Cleveland, where the Bendix Trophy and \$7500 awaited the first to land. With a wave to those watching Major Jimmy Doolittle lifted his trim Wasp Jr. powered Laird "400" off the ground and roared up through the fog and early morning darkness of the Cajon Pass — beginning what has been called one of the greatest achievements of human travel.

He stopped at Albuquerque and Kansas City only long enough to refuel before he was away again. The first, by a wide margin, he landed at Cleveland Airport-winner of the Bendix Trophy Race. But Doolittle was out for even greater honors. Pausing again only to refuel, he tore off for Newark and smashed—by one hour and ten minutes-the previous coast-tocoast record.

Across the nation in 111/4 hours! Thus another trophy was added to the long line of victories won by Laird airplanes. A sterling pilotan invincible airplane.

At Newark, Doolittle gassed up, swung about and streaked back to Cleveland. "I can't say anything about how I got here," he said when alighting, "except that the marvelous engine and the remarkable ship-one of the finest planes I have ever flown-did the trick."

Laird airplanes are noted for their splendid performance among those who know and appreciate good design. They are built for the sportsman-pilot and the commercial buyer whose principal interest is high efficiency rather than price alone. We want such buyers to read our interesting booklet. Write for it— it is free—and for the name of the nearest distributor, who will gladly arrange a convenient demonstration.

### E. M. LAIRD AIRPLANE COMPANY

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Chicago

Clearing Station

Laird airplanes are manufactured only by the E. M. Laird Airplane Company, Chicago, Illinois

# ..KENDALL RIDES

... In the Transcontinental the 1931 National Air Races, by Pilots Winning Over 86%



Never before in Aviation history has any product achieved such overwhelming approval as the free and open choice of Kendall Oil by pilots, both men and women, who

participated in the National Air Races of 1931. Never before has the outstanding worth of a lubricating oil been so thoroughly demonstrated as by the splendid victories in which Kendall had a part. These facts of Kendall performance in the races concern every manufacturer, owner or pilot of every airplane.

Transcontinental Handicap Derbies

For the severe test of speed and endurance demanded in the California to Cleveland Derbies for men and for women pilots, Kendall was the lubricant used in 60 of the 61 competing planes. The results were all Kendall:

Women's Derby
First:
Second:
Third:

Third:

Phoebe Omlie, Women's Transcontinental Handicap Derby winner.

Third:
Men's Derby
First:
Second:

Pilot Phoebe Omlie May Haizlip Martie Bowman

Plane Monocoupe Monocoupe Inland Sport Engine Warner Lambert Warner

D. C. Warren Lee Brusse Eldon Cessna

D. H. Moth Waco F. Cessna Gipsy Kinner Warner



D. C. Warren, first prize winner of the Men's Handicap Derby.

> America's Finest Air Race at Cleveland played to a vast and enthusiastic audience.



KENDALL

# WITH THE WINNERS

Derbies and the Closed Course Events of Kendall Oil was the Lubrication Used of All First, Second and Third Places . . .

#### Free-for-all Speed Classics

In the Thompson Trophy Race for men and the Cleveland Pneumatic Aerol Trophy Race for women, Kendall Oil was with the winners from start to finish:

| Thompson Trophy First: Second: Third: | Pilot         | Plane            | Engine |
|---------------------------------------|---------------|------------------|--------|
|                                       | Lowell Bayles | Gee Bee          | Wasp   |
|                                       | J. R. Wedell  | Wedell-Williams  | Wasp   |
|                                       | "Red" Jackson | Laird "Solution" | Wright |
|                                       | A 1 T . 1     | Lairu Solution   | wright |

Gee Bee "Y" Maude Tait Wasp First: Second: May Haizlip Laird Wasp Jr. Third: Florence Klingensmith Cessna Kinner

#### Kendall-All the Way

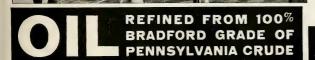
The early records show that in all the events, including the Derbies, there were 311 entries and of these 278 planes were lubricated with Kendall Oil. Out of a possible 31 each of first, second winners, 26 Second Place Winners and 27 Third Place Winners—representing in all 86.02% of the prize winners for all events.

Watch for Kendall advertisements giving further remarkable highlights of the 1931 Races. Join America's famous pilots in choosing Kendall Oil as favorite lubrication for your plane. Kendall, carefully refined from the world's finest and costliest crude-the Bradford Grade of Pennsylvania-will give a full thirty hours of real service in your plane, merely by maintaining the oil level. Write for information on Kendall Oil and a list of Airports where it may be obtained. Kendall Refining Company, Bradford, Pennsylvania.



Lowell Bayles won first prize in the Thompson Trophy Race with a speed of qualifying speed av-eraged 267.342 m.p. h., greatest recorded speed for this event.







# Endurance

Y OU frequently read accounts of Bellanca Aircraft breaking American and World Records for endurance, long-distance and transoceanic flights. Do not make the mistake of thinking that these record breaking flights are mere "stunts." They are conclusive evidence of

The Bellanca Airbus



The Bellanca Skurocket

#### BELLANCA AIRCRAFT CORPORATION

New Castle, Delaware Chrysler Building, New York
Bellanca Aircraft of Canada, Ltd., Montreal

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Bellanca value in commercial air transportation.

Almost every Bellanca monoplane flown in endurance and efficiency contests has been a stock model plane. Bellanca records and trophies are the badges of Bellanca performance . . . a 100 percent performance that is rendered every day, year after year, by scores of Bellanca planes in the hands of air line, industrial, and private owners . . unchallenged proof that, in commercial operations, Bellanca single-engined planes possess supreme stamina and earning capacity.

#### BELLANCA RECORDS

National Air Race Efficiency Contests ten times since 1923, including 1931 National Air Races at Cleveland.

American Endurance Record three times since 1927.

World's Endurance Record twice since 1927, Pilots Lees and Brossy establishing same at 84 hrs. 33 mins., May, 1931, in their Packard-Diesel-powered Bellanca Pacemaker.

Ford Reliability Tour (single-engined cabin plane class) twice since 1929.

World's Long Distance Record in 1927, over 4,000 miles non-stop from U. S. to Germany; in 1931, New York to Istanbul, Turkey, 5,000 miles non-stop.

Commercial Airplane Altitude Record in 1930, 30,453 ft., by Capt. George Haldeman.

Transatlantic Flights in "The Columbia," twice across; also, non-stop to Bermuda and return. In "The Pathfinder," from Maine to Spain. In "The Liberty," non-stop to Germany. In "The Cape Cod," from New York to Turkey. In the "Miss Veedol," from New York to Wales.

# AFRO DIGEST

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No. 4

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AERO DIGEST



This aerial view shows some of the military airplanes at Ferrara airship station before the recent Italian Air Service maneuvers in which 894 airplanes participated

### AIR—HOT AND OTHERWISE

A LTHOUGH the National Air Races are adequately covered elsewhere in this magazine, I find it impossible to allow the issue

find it impossible to allow the issue to go to press without a special commendation of the officials who staged the splendid show and the citizens of Cleveland who so splendidly gave it their hospitality and support. Those officials were bold

city and that of the stranger within its gates are those

citizens of Cleveland.

In the circumstances it is probably true that few other cities would have tackled the task at all, but these groups, being aware that it meant much to the aircraft industry and that the industry means much to the nation first and to their city incidentally, exceeded even their own activities of 1929, that rosy, hopeful, happy year.

men to tackle such a job in such a way in the midst of an

economic crisis. Enthusiasts for the well-being of their

The organizers of the Show needed \$250,000. They called upon their own Lake metropolis and the fund immediately was oversubscribed. In Cleveland Mayor Marshall and the City Commissioners gave more than money—they gave 100 per cent of brains, effort and enthusiasm. The newspapers were splendid; Cleveland's socially positioned, Cleveland's merchants and other businessmen—everyone in Cleveland—joined in. And what a job they made of it!

Furthermore, the races for this year had not all been flown before plans were under way for next year.

At one time we were in doubt about the wisdom of having the races, year after year, in the same locality; but Cleveland certainly has justified her claim to the greatest annual event of the American air industry and fraternity for at least another four years.

Everybody knows that ARRO DIGEST fully appreciates the wonderful achievements of the fliers and all those other details of the great event which meant so much to the art of human flight in all its aspects. Other sections of this magaine prove that we still appreciate these things. Here is the place to pay this little tribute to the management and the citizens of Cleveland who made all these things possible.

Air-minded. That's Cleveland. The breaking of the transcontinental record can be credited, in one of its phases (and a mighty important one) to a small group of Clevelanders who combined to furnish Major Jimmy Doolittle with the backing which enabled him to accomplish the great flight. "Cy" O'Neal of the General Tire Company, Earl Jones of Firestone, W. R. Warwick of the Skywriters formed a syndicate, bought the plane, turned it over to Doolittle and financed him to go out after that

The whole aviation industry owes a debt to Cleveland. Various things, therefore, become apparent. America's aeronautical industry, engaged in an enterprise fascinating to the men associated with it, knows how, under the direction of experts, to make it fascinating to the lay mind as well. The immense attendance of outsiders—outsiders who repeated—testified to the show's general fascination.

Better Than Ever U. S. Absent

Frank A. Tichenor

THE Schneider trophy has ceased forever to be an object for which the most daring and skilful of the aviators of all nations can compete in the effort to lower air speed

records. By the terms of the deed of gift, Britain having won again this year becomes a permanent holder of the symbol which has been as coveted as any ever will be by the time-defying pilots of that swiftest of all man's instruments of travel, the airplane. This year France and Italy were unable to compete and the United States (to the chagrin of thousands of its air-minded patriots) chose not to spend the time and money necessary to make an attempt. Britain's victory, therefore, was uncontested, a circumstance which she probably infinitely disliked. But the Schneider Trophy is hers to have and hold forever and a day.

No stigma attaches to the British for the manner of their permanent acquisition of this great symbol of man's supreme skill and daring. The winning plane did not loaf about the historic course as it might have done. It flew like a bullet, establishing again the superiority as an instrument of speed over anything else ever devised by man of the machine invented by those American supermen, the Wrights. All England had to do was to cover the course. If competitive conditions had existed the mark set would have been many miles more per hour.

The American situation with regard to this great speed contest is regrettable in the extreme. We were not represented this year although we had won in 1923 and 1925; in 1926 we withdrew. Our speed record, 266.59 m.p.h., was set by Al Williams nearly eight years ago. That this great and rich nation which twice had proved its ability to achieve supremacy in Schneider speed contests should have been defeated by sheer unwillingness of those who should have supplied the funds must be a humiliation to every American. There was no occasion for this defeat by default. We have the brains, the skill, the pluck, the cash for victory, the manufacturers who can build in competition with the world. To have competed competently would have cost money, yes; but it will cost us more, in the event of war, not to have behind us what participation in this race would have taught.

England, France and undoubtedly Russia have military planes that will fly miles around our very fastest, while Italy has more than one machine capable of doing well over 400 miles per hour.

The Schneider Trophy, however, served a purpose valuable to mankind. Every advance in speed helps civilization.

But the Schneider Trophy need not be the final symbol dedicated to the momentary champions of rapid flight. It is now the duty of the United States—its duty and its self-protective wisdom—to appropriate the money necessary for experimentation and construction until we shall have produced an airplane capable not only of equalling but of surpassing in speed any similar machine that can be produced elsewhere in the world. This is a matter not only for national pride to consider but for national sense of security to regard as an essential.

### GRANDSTAND OBSERVATIONS

#### AT THE AIR RACES

#### By Pat Murphy

Wonder what kind of a show Jimmy Doolittle and Major Udet would put on in the sky together, and how Pancho Barnes would look in dresses.

Mrs. Omlie and her husband riding in "their" new Cord car which she won in the Derby.

Ray Collins setting the fashions for next year's show with his famous orange and black striped coat.

Art Goebel at a dinner, too sleepy to enjoy the airplane cake made especially for him.

Casey Jones writing a new song.

Earl Ovington, the first air mail pilot, with General Hitchcock, who handed him the first bag of mail to fly.

Betty Lund's costumes, and her husband's prompt response to her frequent calls—"Hey Freddie!"



Rex Uden's smoke bombs for determining wind direction, scaring the scorers on the

Margery Doig known as "Mummy" because she was Ruth Elder Camp's official chaperone.

Majors Brett and Brower conferring with Captain Griffith on the orders for the day.

Lieutenant "Woody" Woodring relating that he is again a schoolboy, attending the Air Corps school at Wright Field. Miss Janet Rex as hostess in the Army box. Janet and her mother entertained nightly at their home in Overlook Drive.

Wonder if Lieutenant Roland Birnn, of the Information Division and announcer for the Army, ever got his car and if any of the newspaper men spelled his name correctly?

Captain Fritz Hammer, skipper of the DO-X, and Mr. Dornier watching with interest the big ship races.

George Post, of Edo float fame, suggesting a waterfront demonstration to stimu-



Official U. S. Army Air Corps photos by J. L. Albright

Some Personalities at the National Air Races, Cleveland, Ohio: Left to right (upper)—Jimmy Doolittle, John Livingston; Charles E. Thompson and Lowell Bayles, Cliff Henderson. (Lower)—Eddie Rickenbacker, Dale Jackson, "One-eye" Connolly (crashing the gate); Frank Hawks; Al Williams.



A few of the prominent women fliers at the Races: Left to right (upper)—Amelificated U. S. Army Air Corps photos by J. L. Albright

Bowman, Gladys O'Donnell, Edith Foltz, Betty Lund; Ruth Elder Camp. (Lower)—Phoebe Omlie; Mrs. Seversky; Dorothy

Hester; Mrs. Maude Tait

late the "gate" at the field. (You know, floats are not used for landplane races.)

Hillig and Major Udet running foot races to see who could take the most snapshots, with Dr. J. D. Brock of Kansas City giving plenty of competition with his movie camera.

Colonel Clarence M. Young being glad to get away on his trip west because his hay fever is back.

Dorothy Hester's flowers and pretty dresses, evidence that a woman doesn't have to be mannish to fly. And she can fly! Ask W. Hawley Bowlus, the glider pilot.

Lon Yancy standing around as usual; will he ever get over his bashfulness?

Amelia Earhart Putnam and her husband greeting friends at the field.

Captain Frank McKee, Director of Aviation for Ohio, appointing Jack Berry Deputy Sheriff for Cleveland.

Tom Lanphier, B. Franklin Mahoney and Father O'Reilly in animated conversa-

Dud Steele, Ray Brown and "Pop" Cleveland deciding what to do with the races postponed from the preceding rainy day.

Johnny Livingston winning another race.

Admiral Moffett saying the races were good. He should know.

Alice La Tarte, official hostess at the Chicago National Air Races, looking more charming than ever.

Cliff Henderson is a mother's boy, taking her with him whenever he can pry her away from their home in sunny California.

Eddie Stinson's genial grin, equaled only by that of his fellow Texan, Jimmy Ray. Frank Hawks' beautiful (there's no better word for it) awning-striped white trousers.

Cliff Henderson's lily white shoes ruined by the mud after the rain.

Bellanca's son, about four years old, watching with a critical eye the crazy flying of Atcherley and declaring with extreme depreciation in his voice, "I could fly like that!"

The pretty girls that de Bernardi attracted.

Orlinski, the Polish flier, roaming around by himself, unrecognized in civilian togs, and ordered to stand back behind the lines—and not doing so, because he understood no English.

Udet's good luck talisman which he pinned in his pocket so it wouldn't fall out while he stunted.

The flag-lowering ceremony when the bugler's notes went sour and the flag refused to come down.

One-eyed Connolly admonishing an astonished gate-keeper with—"Don't you ever stop me!—Understand?"

Colonel Eddie Rickenbacker meeting Major Udet, German war ace, for the first time on the ground. They had met before some years ago, it seems—in the air over the battle lines. I wonder what went on in their minds as they greeted one another—both superb airmen—both equally good sports.

145,221

132,019

Wright J-6

# NATIONAL AIR RACE RESULTS

Transcontinental Handicap Derby. Santa Monica, California, to Cleveland, Ohio (WOMEN'S DIVISION)

|                  | (WOMEDINE            | , 2211201011)      |              |         |
|------------------|----------------------|--------------------|--------------|---------|
| Pilot            | Home Field           | Plane              | Engine       | Prize   |
| Phoebe Omlie     | Memphis, Tenn.       | Monocoupe          | Warner       | \$3,000 |
| Mae Haizlip      | St. Louis, Mo.       | Monocoupe          | Lambert      | 1,800   |
| Martie Bowman    | Burbank, Cal.        | Inland Sport       | Warner       | 1,200   |
|                  | (MEN'S 1             | DIVISION)          |              |         |
| D. C. Warren     | Alameda, Cal.        | D. H. Moth         | Gypsy        | \$3,000 |
| Lee Brusse       | Glendale, Cal.       | Waco F             | Kinner       | 1,800   |
| Eldon Cessna     | Wichita, Kan.        | Cessna             | Warner       | 1,200   |
| Transcontinental | Free-for-All Speed I | Dash for Bendix    | Trophy. Los  | Angeles |
|                  | to Cl                | eveland            |              |         |
| J. H. Doolittle  | St. Louis, Mo.       | Laird              | Wasp Jr.     | \$5,000 |
| H. S. Johnson    | Chicago, Ill.        | Lockheed           | Wasp         | 3,000   |
| Beeler Blevins   | Atlanta, Ga.         | Lockheed           | Wasp         | 2,000   |
| Event 1.         | Men's 275 cu. in. Fr | ee-for-All (5 laps | 5 mile cours | e)      |

|                 |                         |                  |               | Steed    |
|-----------------|-------------------------|------------------|---------------|----------|
| Pilat           | Home Field              | Plane            | Engine        | (M,P,H.) |
| I. Lambert      | Niles, Mich.            | Heath            | Heath         | 119,97   |
| 3. Stevenson    | Kansas City, Mo.        | Monocoupe        | Lambert       | 116,42   |
| Art Chester     | Joliet, Ill.            | Davis            | Le Blond      | 114.61   |
| Event 2.        | Men's 275 cu, in, A,    | T. C. (5 laps 5  | 5 mile course | )        |
| Vernon Roberts  | Moline, Ill.            | Monocoupe        | Lambert       | 116.42   |
| 3. Stevenson    | Kansas City, Mo.        | Monocoupe        | Lambert       | 116,26   |
| Art Chester     | Joliet, Ill.            | Davis            | Le Blond      | 114.82   |
| Event 3. 1      | Men's 400 cu. in. Free  | -for-All (5 laps | 5 mile cour   | se)      |
| Ray Moore       | San Francisco, Cal.     | Keith Rider      | Menasco       | 156,54   |
| Ben Howard      | Chicago, Ill.           | Howard           | Gypsy         | 150.48   |
| . J. Wittman    | Oshkosh, Wis.           | Wittman          | Cirrus        | 150.27   |
| Event 4.        | Men's A, T. C. 400 c    | u. in. (5 laps 5 | mile course)  |          |
| R. L. Hall      | Springfield, Mass.      | Gee Bee D        | Menasco C     | 4 128,53 |
| 3. Stevenson    | Kansas City, Mo.        | Monocoupe        | Lambert       | 116,48   |
| art Chester     | Joliet, Ill.            | Davis            | Le Blond      | 114.77   |
| Event 5.        | Men's 510 cu, in, Free  | -for-All (6 laps | 5 mile cour   | se)      |
| ohn Livingston  | Aurora, Ill.            | Monocoupe        | Warner        | 140.77   |
| Ben Howard      | Chicago, Ill,           | Howard           | Gypsy         | 136.84   |
| Vernon Roberts  | Moline, Ill.            | Monocoupe        | Warner        | 132.97   |
| Event 6         | Men's 510 cu, in. A.    | T. C. (6 laps 5  | mile course   | )        |
| ohn Livingston  | Aurora, III.            | Monocoupe        | Warner        | 148.79   |
| Vernon Roberts  | Moline, Ill.            | Monocoupe        | Lambert       | 144.20   |
| Peter Brooks    | Hicksville, N. Y.       | Monocoupe        | Warner        | 136,60   |
| Event 7. 1      | Men's 650 cu. in, Free  | -for-All (6 laps | 5 mile cour   | se)      |
| ohn Livingston  | Aurora, Ill.            | Monocoupe        | Warner        | 139.50   |
| Ben Howard      | Chicago, Ill.           | Howard           | Gypsy         | 137.68   |
| Vernon Roberts  | Moline, Ill.            | Monocoupe        | Warner        | 133.88   |
| Event 8.        | Men's 650 cu. in. A.    | T. C. (6 laps    | 5 mile course | )        |
| ohn Livingston  | Aurora, Ill.            | Monocoupe        | Warner        | 132.55   |
| Vernon Roberts  | Moline, Ill.            | Monocoupe        | Warner        | 129.96   |
| Peter Brooks    | Hicksville, N. Y.       | Monocoupe        | Warner        | 123.91   |
|                 | Men's 800 cu. in, Free- | -for-All (5 laps | 5 mile cour   | se)      |
| Ray Moore       | San Francisco, Cal.     | Keith Rider      | Menasco       | 185.09   |
| John Livingston | Aurora, Ill.            | Monocoupe        | Warner        | 149.46   |
| Don Hannad      | Chiange TII             | Unmond           |               |          |



Howard

Chicago, Ill.

Ben Howard

Official U. S. Army Air Corps photos by J. L. Albright Lowell Bayles, winner of the Thompson Speed Trophy



Official U. S. Army Air Corps photos by I. L. Albright
Doolittle arriving at Cleveland and winning the Bendix Trophy

Event 10. Men's A. T. C. 800 cu. in. (10 laps 5 mile course)

Plane

Home Field

E. Lansing, Mich.

John Livingston Aurora, Ill.

Art Davis

148.784

| Arthur Davis    | Lansing, Mich.           | Waco 10 T          | Wright J-6    | 141.977 |
|-----------------|--------------------------|--------------------|---------------|---------|
| Lloyd O'Donnell | Long Beach, Cal.         | Waco 10 T          | Wright J-6    | 141.708 |
| Event 11. Me    | en's 1,000 cu. in. Fre   | e-for-All (5 laps  | 5 mile cour   | se)     |
| R. L. Hall      | Springfield, Mass,       | Gee Bee            | Wasp Jr.      | 189,545 |
| Ray Moore       | San Francisco, Cal,      | Keith Rider        | Menasco       | 177,809 |
| W. J. Wedell    | Patterson, La.           | Wedell-Wms.        | Wasp Jr.      | 167,106 |
| Event 12.       | 1,000 cu. in. A. T. C.   | Men's (5 laps 5    | mile course)  |         |
| James Haizlip   | St. Louis, Mo.           | Laird              | Wasp Jr.      | 137.249 |
| John Livingston | Aurora, Ill.             | Monocoupe          | Warner        | 135,240 |
| Art Davis       | Lansing, Mich.           | Waco 10 T          | Wright J-6    | 131.252 |
| Event 13. N     | den's 1,875 cu. in. Free | -for-all (5 laps 1 | 0 mile course | )       |
| Lowell Bayles   | Springfield, Mass.       | Gee Bee            | Wasp Jr.      | 205.001 |
| James Haizlip   | St. Louis, Mo.           | Laird              | Wasp Jr.      | 149,911 |
| Ben Howard      | St. Louis, Mo.           | Howard             | Gypsy         | 147.438 |
|                 | Men's 1,200 cu. in. A.   |                    |               |         |
| John Livingston | Aurora, Ill.             | Monocoupe          | Warner        | 144.327 |
| George Harte    | Wichita Kan              | Cessna             | Wright T-6    | 142 703 |

| Even              | ts 15 to 23 (Eliminat | ed for Lack of E    | Intries)      |         |
|-------------------|-----------------------|---------------------|---------------|---------|
| Event 24. V       | Vomen's A. T. C. 35   | 0 cu. in. (5 laps   | 5 mile course | e)      |
| Mae Haizlip       | St. Louis, Mo.        | Davis               | Le Blond      | 107.604 |
| Flo. Klingensmith |                       | Monocoupe           | Lambert       | 103,376 |
| Betty Lund        | Troy, O.              | Aeronca             | Aeronca       | 70,059  |
| Event 25. W       | omen's \$10 cu. in. F | ree-for-All (5 laps | 5 mile cours  | e)      |
| Phoebe Omlie      | Memphis, Tenn.        | Monocoupe           | Warner        | 129,885 |

| Mae Haizlip<br>Maude Tait | St. Louis, Mo.<br>Springfield, Mass. | Gee Bee D.<br>Gee Bee | Menasco<br>Warner | 129.48 <i>3</i><br>128.333 |
|---------------------------|--------------------------------------|-----------------------|-------------------|----------------------------|
| Event 26                  | Women's 650 cu. in. A.               | T, C. (6 laps         | 5 mile course)    |                            |
| Phoebe Omlie              | Memphis, Tenn,                       | Monocoupe             | Warner            | 132,481                    |
| Mae Haizlip               | St. Louis, Mo.                       | Gee Bee D.            | Menasco           | 131.935                    |
| Mande Tait                | Springfield Mass                     | Can Rea F             | Warner            | 121 174                    |

Event 27. Women's 800 cu. in, Free-for-All (5 laps 5 mile course)

| Gladys O'Donnell<br>Mae Haizlip<br>Opal Kunz | Long Beach, Cal.<br>St. Louis, Mo.<br>New York, N. Y. | Waco<br>Travel Air<br>Waco | Wright J-6<br>Wright R 760<br>Wright J-6 7 |         |
|----------------------------------------------|-------------------------------------------------------|----------------------------|--------------------------------------------|---------|
| Event 28. W                                  | omen's 1,000 cu. in.                                  | A. T. C. (5 laps           | 5 mile course)                             |         |
| Gladys O'Donnell                             | Long Beach, Cal.                                      | Waco                       | Wright -6                                  | 138.638 |
| Mae Haizlip                                  | St. Louis, Mo.                                        | Laird                      | Wasp Jr.                                   | 136.884 |
| Flo. Klingensmith                            | Minneapolis, Minn.                                    | Cessna                     | Kinner B-5                                 | 133.357 |

| Event 29.         | Women's 1,875 cu. in. | A. T. C. (5 ) | aps 5 mile course | ,       |
|-------------------|-----------------------|---------------|-------------------|---------|
| Flo. Klingensmith | Minneapolis, Minn     | Cessna        | Wright J-6        | 141,21  |
| Mae Haizlip       | St. Louis, Mo.        | Laird         | Ranger            | 140.18  |
| Gladys O'Donnell  | Long Beach, Cal.      | Waco          | Wright J-6        | 136.32  |
| Event 30, Men's   | and Women's Mixed     |               | nvitation (5 laps | 10 mále |
| Robert L. Hall    | Springfield, Mass.    | Gee Bee       | Wasp Jr.          | 222.62  |

| Robert L. Hall | Springfield, Mass. | Gee Bee     | Wasp Jr. | 222,62; |
|----------------|--------------------|-------------|----------|---------|
| J. Wedell      | Patterson, La.     | Wedell Wms. | Wasp Jr. | 221,04; |
| James Haizlip  | St. Louis, Mo.     | Laird       | Wasp Jr. | 164,19; |
|                |                    |             |          |         |

Roger Don Rae

Lansing, Mich.



Prominent Visiting Airplanes at the Cleveland Races: Left to right (upper)-The Burnelli Transport which flew to the races with

SEPTEMBER 1

(National Air Race Results continued on page 112)

18 passangers; the Dornier Scaplane flown from Germany by Capt. Wolfgang Von Gronau and crew; Boardman and Polando's Bellanca airplane "Cape Cod," which they flew to Turkey. (Lower)—Frakh Hawks Travel Air; Canadian military trio; Post and Gatty's round-the-world Lockheed "Winnie Mae"

| Event     | 31. Civilian | Acrobatio | Exhibition | n (No  | report | on wir  | ning te | ams)    |
|-----------|--------------|-----------|------------|--------|--------|---------|---------|---------|
| Event 32. | Thompson     | Trophy R  |            | Pilots |        | 10 laps | 10 mile | course) |

Challenger

OX-5

| Free-For-All      |                                                                    |                |                 |                           | Eldon Cessna              | wichita, Kan.       | Cessna           | Warner     |  |  |
|-------------------|--------------------------------------------------------------------|----------------|-----------------|---------------------------|---------------------------|---------------------|------------------|------------|--|--|
|                   |                                                                    |                |                 |                           | John Livingston           | Aurora, Ill.        | Monocoupe        | Warner     |  |  |
| Pilot             | Home Field                                                         | Plane          | Engine          | Speed                     | L. Glasscock              | Dunedin, Fla.       | Stinson          | Wasp Jr.   |  |  |
|                   | les E. Thompson Tro                                                |                |                 | September 2 (with brakes) |                           |                     |                  |            |  |  |
| Lowell Bayles     | Springfield, Mass.                                                 | Gee Bee        | Wasp Jr.        | 236,239<br>227,992        | John Livingston           | Aurora, Ill.        | Monocoupe        | Warner     |  |  |
| J. R. Wedell      | Patterson, La.                                                     | Wedell Wms.    |                 |                           | George L. Harte           | Wichita, Kan.       | Cessna           | Wright J-6 |  |  |
| Dale Jackson      | Cleveland, O.                                                      | Laird Solution | Wasp Jr.        | 211.183                   | George Quick              | San Francisco, Cal. | Bellanca         | Wright J-6 |  |  |
| Event 33, Clevel  | Event 33, Cleveland Pneumatic Aerol Trophy Race, Women Pilots Only |                |                 |                           |                           |                     |                  |            |  |  |
|                   | (5 laps 10 mile com                                                |                |                 |                           |                           | (withou             | (WITHOUT BRAKES) |            |  |  |
| Maude Tait        | Springfield, Mass.                                                 | Gee Bee Y      | Wasp            | 187.574                   | Fred Lund                 | Troy, O.            | Aeronca          | Aeronca    |  |  |
| Mae Haizlip       | St. Louis, Mo.                                                     | Laird          | Wasp Jr.        | 165,201                   | T. Cushman                | Cincinnati, O.      | Aeronca          | Aeronca    |  |  |
| Flo. Klingensmith | Minneapolis, Minn.                                                 | Cessna         | Wright J-6      | 160.327                   | Hugh Spooner              | Montreal, P. O.     | Curtiss Reid     | Gypsy      |  |  |
| E                 | vent 34. Men's Deads                                               | tick Landing C |                 |                           |                           |                     |                  |            |  |  |
|                   |                                                                    |                |                 |                           | September 4 (with brakes) |                     |                  |            |  |  |
| Pilot             | Home Field                                                         | Plane          | Engine          |                           | John Livingston           | Aurora, Ill.        | Monocoupe        | Warner     |  |  |
|                   | August                                                             | 30             |                 |                           | George Harte              | Wichita, Kan,       | Cessna           | Wright J-6 |  |  |
| John Livingston   | Aurora, Ill.                                                       | Monocoupe      | Warner          |                           | Lester Glasscock          | Dunedin, Fla.       | Stinson          | Wasp Jr.   |  |  |
| Lloyd O, Yost     | Niles, Mich.                                                       | Waco           | Warner          |                           |                           | /                   |                  |            |  |  |
| Arthur Davis      | Lansing, Mich. Was                                                 | Waco           | Vaco Wright J-6 |                           |                           | (WITHOUT BRAKES)    |                  |            |  |  |
|                   | August                                                             | 21             |                 |                           | Harold Newman             | Moline, Ill.        | Travel Air       | OX-5       |  |  |
| Thos. Cushman     | Cincinnati, O.                                                     | Aeronca        | Aeronca         |                           | Fred Lund                 | Troy, O.            | Aeronca          | Aeronca    |  |  |
| H. A. Speer       | Cincinnati, O.                                                     | Aeronca        | Aeronca         |                           | T. Cushman                | Cincinnati, O.      | Aeronca          | Aeronca    |  |  |
| an in opeci       | Cincinnati, O.                                                     | ricionca       | ATCIONCA        |                           |                           | * '                 |                  |            |  |  |

Official U. S. Army Air Corps photos by J. L. Albright

Al Williams' Foreign Exhibition Fliers and their airplanes: Left to right (upper)—Capt. Boleslaw Orlinsky of Poland and his P. Z. L. monoplane; Major Ernst Udet of Germany; Commander Mario de Bernardi of Italy and his Caproni biplane. (Lower)—Captain Atcherley of England (who flew a Curtiss "Fledgiling"); Udet's "Flamingo" biplane; and Captain Alois Kubita of Czechoslovakia (who flew a Great Lakes Trainer)

### THOSE REAR VISION RACES

# by baldwell

F I'd only known what the National Air Race organizers were up against at Cleveland this year, I'd have been able to see the races, because I'd have come there equipped with a periscope borrowed from Sir Hubert Wilkins. Sir Hubert didn't need a periscope anyhow, as it turned out, because he merely sunk under the ice, looked at a few fish and icicles, and then radioed that he was returning with his sub-submarine and his finances somewhat bent.

But if Sir Hubert didn't need a periscope. I certainly did, for without it I saw only a corner of the Air Races. And that's all anyone else saw, unfortunately, for which condition nobody at all is to blame. It may seem odd that I can't find anyone to blameoutside of President Hoover

and the Bolsheviks, who always get the blame for things we can't hook onto anyone else-but the fact of the matter is that until a change is made, the Cleveland Municipal Airport is unsuitable to hold really interesting races. Which is not to say that it can't be made the place, for it can.

The races were held chiefly in a ravine far back of the grandstand. We saw them take off, fly to the scattering pylon, come back on the course-and disappear. Where they went, none but a few of us knew. They simply were; and then they were not. A rush and a roar-and they were gone where the woodbine twineth. The last we saw of them, they were heading North. Minutes later they came back from behind the stands, made a practically unbanked turn before the judges' stand, and again went streaking off into the vast unknown

One of the pathetic sights was the vain struggle of a radio announcer to inject an air of excitement into his account of the races. "There they go, ladies and gentlemen," he would howl, all a-jitter with emotion. "They are racing away from us at terrific speed. Away-awaya-way-ee! Now they are out of sight behind the stands They will be back in a minute—the excitement is intense, ladies and gentlemen-four minutes-we're all waiting eagerly to see them again-five minutes-they should be here any minute now. What a wonderful day it is here, ladies and gentlemen. The excitement is something fierce-



"Can you hear me, Al?" Cy Caldwell broadcasting to Al Williams in flight

I just saw Pancho Barnesthe racers should be back any minute now. The people are so excited they are stamping their feet. Now the announcers are introducing a famous pilot-I didn't catch the name-he said, 'I'm glad to be here-a fine race we are seeing, in just a few minutes.' They'll be back any minute, now, ladies and gentlemen. I must ask you to be patient."

The broadcasters did their best, but they already had described the field seventeen times, and there was nothing else in sight for minutes and minutes. Finally, between laps, they resorted to announcing the movements of a school of goldfish in a pond by the announcers' stand. This brightened up the broadcasts considerably-and did no harm to the fish.

With everything back of the

stands and nothing in front of them, a concessionaire would have cleaned up a fortune selling rear vision mirrors and periscopes. The only chap who could see much was Willie Westinghouse, the robot-he was facing the stands. It was pretty much as though the automobile races at Indianapolis were run with all the seats facing the other way. Somebody suggested putting the stands on a revolving platform-a good idea, but there wasn't time to put it into effect

Now if anyone was to blame for this result, I'd be glad to pin the blame on him. But all we can blame are the flying conditions on the Cleveland Municipal Airport. So great is the movement of passenger transport, air mail, and other commercial and private planes from the port, that it would be unsafe and absolutely inadvisable to plan a course that would be in front of the stands as they are situated today. Cleveland Airport must be kept open, even during races; racing planes should not and must not cut across the path of commercial craft engaged in the business of aerial transportation. If any accident occurred, such as a collision with a passenger transport, any benefit we might have derived from more interesting races would be washed out, and the National Air Races would be written up as a hazard to aviation and the safe transportation of the public on our airlines.

Under existing conditions, the Contest Committee and

the Race management planned the course sensibly and safely, for which they are to be commended. However, we must not rest content with uninteresting races held behind the stands. We must get together behind a plan that will put them out front where they belong, and yet put them there with safety.

Now as for the rest of the show, it was excellent. The flying couldn't be better than that at Chicago last year. In fact, it was just about the same. When pilots reach a certain stage of expert airmanship and put on such shows as the Army, Navy, Marine and commercial pilots put on at the National Air Races, there isn't much they can add to it from year to year. I saw only one new stunt, the Army's Three Turtles rolling their formation of three planes in unison-at least, it was new to me. I don't mean that the three planes rolled within the formation; I mean that the complete formation of three planes rolled about its path of flight. It was as graceful and apparently as difficult a piece of precision flying as I have seen. The planes seemed only about a yard apart, and they kept that distance, neither closing up nor spreading out, during their remarkable maneuvers.

The Three Siskins of the Canadian Air Force were quite as expert as the Three Turtles in any maneuver they performed. In fact, as they did their work at a much lower altitude they were more spectacular from the viewpoint of the spectators in the stands. Furthermore, as their Jaguar engines and wooden propellers made but little noise, the Siskins presented the strange illusion of gliding smoothly through their maneuvers, while the Turtles, making more uproar with their metal propellers, were obviously flying through the various evolutions. However, that formation roll gave the stunt honors to the Three Turtles. I was sorry we didn't see them more frequently, and that they were not permitted to fly a little lower. In the interests of safety, however, they were ordered to fly high, which they did.

The Army, Navy and Marine formation work was up to



Photo by Heck Excitedly watching the Air Races, we have the Misses Abigail Axelrod and Matilda Klutz, who plan a transatlantic hop. These fair misses will give the air currents something to think about

the standards we have grown accustomed to during the years. It must be seen to be appreciated, Incidentally, I was just wishing that we could see it from a somewhat lower altitude, when two Marines touched wingsand then I was relieved to think the commanding officers had taken sufficient notice of the chances of a collision to order all formation work performed at a safe height. As Lieutenants Sanderson and Brice parachuted to safety, their planes crashed, the one in a field and the other on the roof of a school. Trust the Marines to lead the way, even in the work of bringing the possible benefits of aviation home to the school children.

This collision demonstrated the wisdom of flying all formations at a safe distance from the crowded stands. If a plane falls on the field, or around the field, those under it have a good chance of moving away; if it falls in the stands there is not only no hope for those immediately under it, but the certainty that many spectators, perhaps hundreds, will be injured or killed in the resulting panic. In general, the farther away from the stands all formation and stunt work is performed, the better, even at the cost of losing part of the spectacular value of these events. I saw three distinct occasions where airplanes, piloted by our most accomplished stunt merchants, didn't come out of an evolution exactly where the performer expected them to come out. One pilot-a noted expert airman-came out of a loop and roll just over the grandstand, to the consternation and surprise of the timers, who claimed they could have touched his wheels-which, of course, they couldn't. He explained afterward that he hadn't allowed quite enough for the wind. Evidently not. Still, after an airplane has hit a crowded stand at some two hundred miles an hour it's going to be poor comfort to learn that if the wind hadn't been blowing, a dozen or so people might have kept on living.

Here's a suggestion that I hope is taken into consideration next year. Why not run a white line some five hundred feet out from the stands, along the line of the stands, and order that all pilots—which includes visiting foreign pilots as well as our own—should perform all maneuvers on the field side, not the grandstand side, of that line. A sensible exception could be made for such flying as Flight Commander R. L. R. Atcherley performs, for that amazing aerial clowning is safe, even for the performer himself.

The Air Races, considered as a competently managed show for the public, are improving each year, thanks very largely to the skilled and sensible management of Cliff Henderson, Managing Director, and Phil Henderson, Assistant Manager. All of the good features of former

races have been retained, and have been smoothed out. The disorderly confusion of past years has become the orderly confusion of 1931; and I hope that 1932 will be even better. It should be. Now that Cleveland is the permanent home of the races for the next four years it should be possible to secure the services of the same people, in the same jobs, so they may become more and more expert through practice.

The Contest Committee — a committee that usually functions in more or less of a flat spin—sailed along to the satisfaction of nearly all, including it-



Photo by Gosh

And here about to make an ascent, we have Mr. Landon Butts, of the Southampton Butts, noted parachute jumper who always lands in the stands. "Parachute jumper feel no pain," said Mr. Butts



Official photo, U. S. Army Air Corp.

Higher M. Buckem before the microphone at the air races bleating out the merits of the M-A-A-

self. Pop Cleveland, as Mastodon of Ceremonies, surpassed himself, and nearly all the lads threw themselves into their work not only with enthusiasm but with common sense—a quality not always present in previous years. Let's try to keep them together for next year. And let's drop some who have demonstrated that they are unfitted for or have no interest in the work. There were men on the committee who had no intention of doing any work, and who were even honest enough to say so, yet they were put on. Why? Nobody knows.

The timing, under the expert guidance of Carl F. Schory, was better and immeasurably faster in handing out results than it ever has been before, thanks to the Marchant calculating machines which are quicker and more accurate than any mere human can ever be. The Starters under Ray Collins and Operations under Ray Brown worked with the smoothness of a Dry lobbyist sliding around a Congressman—and there's nothing in the world smoother than that. And I mustn't forget Field Communications under Earl Southee, the Swamproot Ace, on whose committee I worked.

I've got a better job picked out for myself next year—
I'm going to be the man who interviews the cash-box
keeper. It's the best job at the races. The fellow who
had it this year—nobody ever found out his name—walked
into the cash office where they keep the money from ticket
sales, and said, "There's a phone call for you just outside
the door." The cashier stepped out and found someone
was on the wire asking him a lot of questions. When he



Official photo, U. S. Army Air Corps

Al Williams who followed Cy Caldwell's radio commands

hung up and returned to his office he found that his caller had left, and so had \$450 in cash. That interviewer was the only one who made any money, and he wasn't even on a committee.

Say, the Livingston-Roberts Feud, that I believe started generations ago in the Kentucky Hills, flared up in all its fury. But this time the Livingston Clan won in a walk-away. The Roberts Clan didn't have a chance. It seems a Livingston fired at a Roberts with a N.A.C.A. cowling, and routed the Roberts interests so they never recovered. All Vern Roberts could do this year was to chase Johnny Livingston around the course.

The pass situation, I am glad to report to my six tired readers, remains unchanged. The Battle of the Passes is staged each year, with odd sorties here and there, and an occasional skirmish we haven't witnessed before; but in its main elements it's the same old battle. The public is trying to get in for nothing and the race management is trying to get them in for something.

Friends got passes, went in—and threw the passes out over the top of the stands for other friends to use. Sixteen good men and true went in on one pass, I was told. I believe it. I watched a whole family go in on one pass—a father, mother, and three children. I happened to know the father, a mechanic, who explained to me how it was done.

Then the management, fighting a losing game with the horde of pass holders and pass sharers, got up a new dodge—to punch the pass each day, and issue pass-out checks. Even our field uniform sweaters were not a pass—the smart lads about town had bought blue ones that looked very much like the uniform ones the committeemen wore. So every time we went in or out of any enclosure, we had to show passes, checks, and whatnot.

The Eattle raged from dawn to dark. The gatemen were good, but the crowd were better. The numbers who got in free, on friends' passes, were estimated in the thousands. Still, it was difficult trying to work it without a pass. A parachute jumper who landed outside the stands couldn't get back in. A parachute wasn't a pass. It seems about a hundred young lads had made up bundles of burlap, told the gatemen they were carrying parachities from which they had only just unharnessed themselves, and thus had got in free. When a real jumper arrived, they wouldn't believe him.

Among those who got in free were One-eyed Connolly and Colonel Roscoe Uniform Turner, gate crashers par excellence, by special appointment to His Majesty the King, and a couple of governors. Roscoe and One-eye wouldn't accept a pass if offered one—they prefer to crash the gate. Although he always has been entitled to a pass, Roscoe has never accepted one for himself yet. He simply declares, "I am Roscoe Turner," fixes the gateman with a frigid stare, and in he goes. That Gilmore lion he used to carry grew too big, so Roscoe put it in a cage on Beverley Boulevard in Los Angeles, and now carries Governer James E. Rolph, Jr., of California, instead. Governor Sunny Jim is doubling for the lion, as it were. He'd better be careful not to grow too big or Roscoe will put him in that cage with Gilmore.

Among those missing this year was dear Mother Tusch, who was too ill to attend. But a good many of her old boys thought of her and missed her—including this especially tough old one who writes this. Mother, you must be with us next year.

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#### THREE WEEKS' LEAVE

#### By Don Rose

ITIZENS of no importance, even as you and I, are worried just now with a riddle that might have given the Sphinx a headache. Times are bad, and nobody seems to know whether they are getting better or worse. The problem, therefore, is briefly this: shall we go cautiously and live carefully, save our money and take thought for the morrow, and run the real risk that something or somebody will go busted and take us along? Or shall we spend our money while we have it, contribute our mite to better business, and take a chance on being caught some day with nothing in our pockets or the bank account?

Nobody really knows whether the thrifty or the spendthrifty are the more desirable citizens in the middle of a depression. It seems wicked to be wasteful, but it seems equally reprehensible to be tightfisted. Those who manufacture commodities for sale and those who sell them, pray every morning and evening that people will loosen up. But bankers and other queer fish are equally certain that we should feed every spare nickel into our savings accounts.

Having wrestled all summer with this curious problem and paradox. I decided at last to obey a reckless impulse. For no good reason I resolved to take three weeks vacation instead of two, and to spend it high, wide and handsomely. The excuse was that if I spent all my savings and borrowings on a real holiday, I would have the pleasant memory thereof for years and years and years. If I saved the money. I should eventually spend it or somebody would take it away from me, and then I wouldn't have anything.

So the wife and one of the elder offspring and the alleged head of the family startled and shocked the neighbors one day in August by leaving the rest of the youngsters at the mercy of relatives and the hired girl, and took off for Europe. Three weeks and two days later we were back again.

We won't stop now to discuss the question as to whether it was mere foolishness to go so far for eleven days ashore. The simplest possible answer is that we had a swell time. It started when we stepped on the boat, or a little earlier, and ended when we walked off another into the hottest day of the year and two hours of torture at the hands of the customs service. We felt as though we had been away for three months or three years. For in the time that it takes to catch a cold and get over it we had traveled 8,000 miles, visited a score of places that deserved it, surveyed another civilization and sampled the life of all levels of its society. We had seen old friends and made new acquaintances, visited old haunts and tried new trails, and stuffed ourselves full of history, scenery and amusing experience. We had traveled 500 miles by automobile in England and been four times to the theater. And when it was all over, we were completely demoralized for all ordinary occupations and thoroughly worn out, so that a week or so later we feel perfectly elegant, which proves that no healthy person ever improved his condition by

I went through a thousand miles of England with one eye, at least, alert for anything relating and referring to aviation. The conclusions I brought back with me probably don't amount to anything; they are, after all, the impressions of only an eleven-day stay, during which time I was acting as guide, manager, treasurer and peacemaker to a party of four, including three ladies of divers ages and temperaments. It was nice, but it was never tiresome. And if English aviation was to get any attention during my tour, it had to get in my way. I hadn't time to go looking

The result was that I didn't see it. In a thousand miles of traveling around England, as far North as Yorkshire, down into Essex, and all over the West country, I think I saw just six airplanes. One came out to meet us in the Solent, off Southampton, and flew around the Aquitania to entertain the tourists. A second was a Schneider Cup racer standing on a ramp on the Isle of Wight, looking vaguely like a rather small wasp. A third was waiting on the Hendon aerodrome for the rain to stop. We came back the same way two days later and it was still waiting; otherwise there wasn't a sign of life on the field.

A fourth was probably a stray from an air circus performing at Leeds. I think it is significant of the status of aviation in England that a handful of barnstormers can still stir up a lot of local excitement in the territory up North. This circus, so far as I could find out, was the sort of thing that dates ten years back in this country. The lad who drove our car was quite keen about it. But he had never been in the air and admitted that he was scared to try it.

The fifth plane was a military ship flying high over Salisbury Plain, where the English army does it practicing. The sixth was a big transport, probably on its way

from Ireland to Croydon. And that was all.

I may be misjudging my native land when I say that aviation is seven leagues behind us in England. But the facts, as I saw and heard them, seem to say so. The big difference seems to lie with the public attitude toward aviation, not with designers, pilots or the comparative excellence of individual airports or flying services. Had I seen Croydon I might have been much impressed with the efficiency and activity of an international airport, and brought home the idea that we have still a lot to learn. Had I watched the fighting ships of the British air fleet I might have something to say of comparative speeds and armaments. But in one respect I'm glad that I didn't. For it is more interesting and important to know what the man in the street thinks of aviation as a commercial convenience, business utility and oportunity for private amusement. And the man in the street in England simply doesn't take commercial aviation seriously, so far as I could find out.

He thinks highly, of course, of the fighting air fleet. He is vaguely aware of the fact that a lot of well-to-do Englishmen have their private planes, though it is quite clear that they must do most of their flying somewhere else. He is pleased to think that from Croydon one may fly to any of the capitals of Europe, though he never thinks of doing it himself. He looks on aviation, indeed, as something beyond his personal province-something for the army and

(Continued on page 118)

## The Michigan Board of Aeronautics

#### By Major Floyd E. Evans, Director

HE Michigan Board of Aeronautics was created by law during the 1929 session of the State Legislature. It consisted of five commissioners appointed by the Governor to serve for a period of five years. During the recent session the State Highway Commissioner and the Commissioner of Public Safety were added as members of the Board. When it was created, many in the industry considered the Board a political nuisance. It has since passed through the stage of a necessary evil and is now gradually taking its place as a useful department.

The function of the State Air Board is to carry out the will of the legislature on all aeronautical matters. The air laws of Michigan are very broad and are as nearly as possible strictly in accord with the United States Department of Commerce regulations and recommendations. planes operating commercially in the state must be licensed by the Department of Commerce, all pilots must possess the appropriate Department of Commerce pilot's license and all planes, even though not operating commercially, must be maintained in an airworthy condition. All airports and landing fields used for commercial purposes must be inspected and licensed by the State Air Board. All schools of aviation and aviation instructors must be licensed and the United States Department of Commerce air traffic rules must be obeyed. All aircraft in the State must be registered with the Secretary of State and pay a registration fee based on two and one-half cents per pound of net weight of the aircraft. This registration fee is in lieu of all property taxes on an aircraft and corresponds to the automobile weight tax which is levied in this state.

A three-cent gasoline tax is in effect in Michigan. Operators who show proof that they are operating interstate on a regular schedule get a one and a half cent refund on the gas tax. All money received from the aviation gasoline tax, from the registration of aircraft and from the licensing of schools, airports, and instructors is placed to the credit of the State aviation fund.

There was passed at the recent session of the legislature a law authorizing the establishment of emergency landing fields by the Board of Aeronautics. A recent law also instructed the Air Board to study the possibilities of the development of the aviation industry in the state, to collect and disseminate information on aviation, to chart the civil airways in the state and arrange for the publication of maps of such airways and to encourage the establishment of airports and air markings. The Board is also authorized to establish a state aviation weather reporting service.

A program and policy for the establishment of emergency fields has been adopted by the Board and the work is now under way for actual development of them. The current year's program calls for the installation of fields along an airway extending north from Lansing to the Straits of Mackinaw, thence west through the upper peninsula to Ironwood. The first field is to be established approximately one hundred miles south of the Straits making an airway about four hundred miles long. The plan is to locate the fields twenty miles apart and as nearly as possible along a straight line. In the selection of the sites

three things are kept in mind, namely, proximity to a main highway, nearness to a railroad and nearness to a town or city. It is believed that these fields will be most often used during stormy weather at which time the airman will likely be following a railroad rather diligently. If placed near a main highway the pilot and passenger will be able to secure quickly transportation to the nearby town. By placing the fields near a town or village, the Board enhances the probability that these towns will eventually take them over as local airports.

The reason for the licensing of all airports and landing fields is not apparent to everyone, but it is thought that the time is not far distant when all states will have the same requirement. Many aviation accidents have been caused by a pilot's attempting to "barnstorm" from a field that is altogether too small for safe operation with his particular equipment. An overzealous pilot will often take a chance on using a hazardous field if he feels that a good number

of passengers can be secured.

Schools of aviation and aviation instructors are licensed for two reasons. First, as a matter of safety for the students, and secondly for the purpose of eliminating the so-called "gyp" schools. These schools were very numerous in this state before the law was enacted requiring all schools to be licensed. Many unscrupulous operators were taking money from the public under the pretense of instructing them in flying. Many schools had no flying equipment whatever; others had equipment that was apparently unsafe for use for instructional purposes. Salesmen for these schools were promising employment after the completion of their flying course. As soon as the State Air Board started functioning practically all of the schools not properly equipped and operating in good faith vanished.

The State Board investigates all aircraft accidents and endeavors to give the public the truth regarding the cause of the accident if it can be determined. A great number of the accidents in this state have been due to the fact that the aircraft had not been maintained in an airworthy condition, or that the plane was inherently unsafe. Many accidents have been due to the habit of pilots of little experience of taking a friend for a flight with a dual control plane and allowing him to manipulate the controls to see how easily a plane can be handled. As a result, the novice often puts the plane in some maneuver that neither he nor his inexperienced pilot can bring it out of before a crash. Violators of the Department of Commerce and State Air Traffic Laws are the next most numerous casualties. The red-blooded young generation seems to delight in skimming trees and doing acrobatics with no respect to the laws of gravity.

The State Air Board is endeavoring to enforce the air laws and do all things directed by the legislature in such a manner as to encourage flying of all kinds and to create in the minds of the public a feeling of confidence in the air-plane as a transportation vehicle. Michigan has every reason to foster the aviation industry. It holds an enviable place in the aviation world in the manufacture of aircraft

(Continued on page 117)

# EDITORIALS



#### OPERATORS AND THE PILOTS

SOMETHING at least as thick as smoke recently has been issuing from the points of contact between the Air Mail operators and the various pilots' organizations. Where smoke is, a smoldering fire must be. Flames should be avoided. Understanding will be necessary to prevent a conflagration.

Especially it must be understood that if economic conditions change, procedures must change. This rule now inevitably must affect both operator and pilot. The pilot is equal in importance to the plane in air transport, but the operator is a third essential. The pilot cannot win and be unfair in his demands upon the operator any more than the operator can win while being unfair in his treatment of the pilot. Somewhere is a common ground whereon operators and pilots may stand and work in harmony.

Aeronautics is young. The biggest thing we know about it is that there are many things about it that we do not know. As an instrument of exploration it is profoundly valuable. Cannot its explorers find that common ground? It would seem to us that they might do so.

Air Mail contractors have not been making money. Just at this time that does not set them apart. We all have heard of others who of recent days, weeks, months and even years have not been making money. If we judged American business as a whole by the brief period toward the end of which (pray God!) we now are marching, the United States would have small reason for optimism. We are in the foggy lowlands now, but soon we shall be up again where shines the sun.

Live and let live, in the meantime, will be good policy for everyone concerned. The doctrine of dog eat dog must lead to dog extinction.

Careful research makes it evident that the Air Mail pilot is far better paid than the Air Mail executive. He is worth every cent that he can get, but not for long will he be able to get anything if the company employing him loses money ceaselessly. The fact that at present the companies are non-profit making may not be wholly due to exorbitant salaries paid to the white collar men. In one company concerning which AERO DIGEST has detailed information, salaries (taking all of them together from the president down and including pilots) do not average \$200 per month. In the same company the pilots' pay averages \$700 and amounts to over ten per cent of the total cost of each mile flown.

Conditions have changed. Readjustments have been necessary to continued success of the Air Mail. These must be worked out on a basis absolutely fair to all the interests concerned. Such a necessity always entails some difficulty, but in this case none is to be found that cannot be overcome by intelligence and fair-mindedness on both sides. The quicker such an impulse gains the ascendancy the better it will be for the whole industry and everybody in it.

#### FLYING LADIES

A T all aeronautical contests and events of late, women have distinguished themselves. They are playing a real part in American aviation and will play an even greater one in days to come. Certain women's names have become super-eminent and more of these will appear upon our rolls of honor as the years pass.

This is as it should be. If the women of America become thoroughly air-minded they will influence their sons and daughters in the same admirable direction. Certainly it is most desirable that the youngster who becomes interested in aeronautics should find that his mother knows the language he is learning to speak.

An ideal of future America will be a more complete community of interest between men and women than the world elsewhere has known. Foreigners say we have harmed ourselves and our womankind by placing the latter upon pedestals. We deny the harm. We have placed women upon the pedestal of partnership and thereby we have gained far more than they have. American and English aviation are very fortunate because the women of these two nations rather more than those of others have become really interested in our young and lusty art. Mrs. Omlie, Mrs. Haizlip, Miss Tait, Miss Hester, and all their other daring, brilliant and intelligent sisters are contributing great values through their competent and constructive air-mindedness.

#### COMMERCIAL PLANES IN WARTIME

SOME of our Army officers have not hesitated to express doubts as to the military usefulness of commercial airplanes, designed for peace service, in the event of war.

Major General Douglas MacArthur, Chief of Staff of the United States Army, doubtless will voice different conclusions when he announces the information which he gathered as an observer of the recent French war games. Commercial airplanes, each capable of carrying twentyeight soldiers and their equipment, were used by the "Red Army" in preparation for that final attack which won for it a difficult victory. Without this use of peace-time air vehicles for transport purposes in the maneuvers, the collaboration of tanks, armored cars and cavalry, which the transport planes assisted, would have been much less effective.

But one need not turn to these maneuvers for illustrations of the point. In wartime every means of transport is of advantage. Paris was saved from the Germans because soldiers were rushed to the front line in its omnibuses, certainly peace-time vehicles, and one of these is now preserved as a relic historical of the French capital's salvation. In every war since the railroad age began, ordinary passenger cars have been used as troop transports and ordinary commercial ships have been employed for like purposes where marine carriage has suggested itself.

In exactly the same way, and to the same incalculably valuable extent, commercial airplanes unquestionably will be used for transport of men and materials if and when (unhappily) another war should occur. And serving thus they easily may have an importance comparable even with the fighting air machines. Indeed some of them well may be fighting machines in fact, for their use as bombers inevitably suggests itself.

## THE MEASURED LIFT OF AIRFOILS

#### Dr. Max M. Munk's Sixteenth Article on the Principles of Aerodynamics

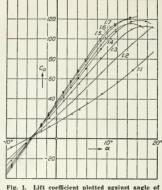
HE final adoption of a wing section for a specific airplane design is generally based on laboratory tests with that section, or on flight experience with it, bringing out its superiority and special fitness for the particular purpose. For preliminary layout and for the discussion of general questions, a more summary method is better suited. The special aerodynamic properties of individual wing sections almost disappear when compared with those of a whole group, and fall in line with those of all other wing sections of similar and conventional shape. It is pos- -10° sible to formulate quite general rules describing the air forces of conventional wing sections, and they are exact enough for most purposes. In some respects these rules are really more reliable than wind tunnel tests, particularly when the

tests are undertaken at small scale or under unfavorable conditions.

We begin with the discussion of the wing lift. A knowledge of the relation between the variation of the lift and of the angle of attack is needed in connection with stability computations. On the other hand, the maximum value of the lift coefficient is paramount for the value of the wing section. Beginning with the former relation over the entire range of the angle of attack, experience shows that the lift of airfoils agrees fairly well with the one predicted

by theory, provided the angle of attack remains below a certain critical value. When that angle is reached, the lift drops more or less suddenly, or at least fails to increase further with the angle of attack, in direct contradiction to the primitive theory.

This sudden change of the relation between the air force and the angle of attack is the main symptom of a similar irregularity of the entire air flow in all its features. The semi-potential flow taking place at small angles of attack collapses at the critical angle and fails to continue beyond it. Instead, an irregular and periodic air motion sets in, with regions of violent turbulence, and distinctly different from the theoretical potential flow. The process of collapsing from the smooth and laminar potential flow to the turbulent periodical air motion has been



attack for different aspect ratios

60

80

Fig. 2. Lift coefficient plotted against angle of attack for different aspect ratios, reduced to the aspect ratio 5.

10

termed "burbling." The wing section flow burbles at a certain critical angle of attack, like water when the boiling point has been reached. This angle of attack is called the "burbling point,"

The primitive theory which specifies a lift growing indefinitely in proportion to the angle of attack gives a good description of what actually happens up to the burbling point only. Beyond the burbling point the theory fails utterly. So does the theory of the plain compressive strength fail with a column when the critical buckling load has been reached. Nothing short of an entirely new way of approach will then suffice. A wing theory specifying the lift to be proportional to the sine of the angle of attack rather than to the angle itself is more exact and logical but is of no greater use than the more primitive state-

ment, because below the burbling point there is hardly any difference between the angle of attack and its sine, and beyond it neither relation holds.

The first measurements of the wing air forces were undertaken without any prejudice or expectations, and they provided the basis for the theory and for the rules indicating agreement with or deviation from this theory. With today's knowledge, we have learned to look at new wing section test results more critically. We anticipate certain relations beforehand, and determine at once how

> far the wing section in question is peculiar. We ask ourselves how far the new section deviates from primitive theory, and whether it does so in conformity with other ordinary wing sections or is different therefrom. Such critical study of results emerging from the aerodynamic laboratory constitutes a check on the laboratory work, Furthermore, it furnishes an effective means for memorizing and grasping the result. The number of wing sections tested reaches into the thousands. Some kind of classification is indispensable for digesting this material which continues to flow in.

With respect to the lift, such classification is furnished by concentrating on these three quantities: slope of the lift curve, angle of attack of zero lift, and maximum lift coefficient. The lift curve is the line obtained by plotting the

lift coefficient against the angle of attack. It is fairly straight up to the burbling point, and its slope is well predicted by theory. The influence of the aspect ratio on the slope is indeed better described by the primitive theory than by any other method or rule. This primitive theory assumes and takes account of a standard lift distribution along the span only, and neglects the additional or secondary downwash arising from a deviation of the actual lift distribution from the standard lift distribution. The difference is charged to direct wing section effects. This is entirely admissible as long as it does not interfere with a truthful elimination of the aspect ratio. We need a method for correctly converting the air forces for one aspect ratio to the air forces for another aspect ratio. The simplest method furnishing such conversion is the best, no matter whether it is the most scientific one. The correctness has to be established by application to experimental data.

In Figure 1 a group of lift curves are drawn for airfoils with different

aspect ratios but with the same wing section, as obtained from wind tunnel tests. The spreading out of the curves into a group of distinctly different lift curves, one for each aspect ratio, is clearly seen. In Figure 2, the same test data are again reproduced in the shape of lift curves. Now, however, they are all converted to the same aspect ratio, 5, by the use of the primitive theoretical formula. The soundness of the method is strikingly demonstrated, for the difference between the curves disappear through its use. The points no longer spread over the diagram but now cover only one curve. The coincidence of all curves is as perfect as can be in view of the experimental errors of the measurements. This success then settles the question about the measured angle of attack, and gives us the confidence needed to apply the theoretical conversion formula universally.

It can particularly be applied for the computation of the effective angle of attack, by converting the air forces to an infinite aspect ratio. The slope of the lift curve converted in that way is suggested by theory as 2π, per unit radian of the angle of attack, giving about .11 lift coefficient per degree of the effective angle of attack.

A survey of a great number of airfoil tests shows that the measured lift is a little smaller than this theoretical value, though for airfoils only, strange to say. With propeller blades the opposite is true, and the theory is hence by no means consistently contradicted by all experience available. With airfoils, however, there exists a consistent reduction. The reduction is not quite uniform, but generally so, and opinion still varies as to which average reduction to take. For practical purposes it is exact enough to take a reduction which seems to be slightly under the true value, but which leads to a very convenient rule. Nine per cent reduction gives an increase of .1 of the lift coefficient per degree of the effective angle. For 10 degrees

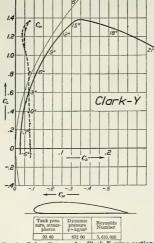


Fig. 3. Polar diagram for Clark Y wing section, showing the burbling point

then the increase would be 1.0. This rule has long been used by the author and is proposed for practical use as long as the necessity for a different value has not been demonstrated.

This rule of one-tenth lift coefficient for one degree angle of attack holds for the effective angle of attack or the infinite aspect ratio only. With the aspect ratio a, it gives

 $\frac{0.1}{1 + 2/a}$  per degree, so that for the

aspect ratio 6 it gives .075 increase of the lift coefficient per degree.

The reduction of the lift from the theoretical value  $2\pi$  to 91 per cent of this value brings about a change of the expression for the lift sustaining capacity or efficiency of the wing. The effective angle of attack is larger than proposed by theory, but not the induced angle of attack. The influence of the induced angle on the effective angle is therefore weakened. The induced angle of attack is still  $C_{\rm L}/\pi a$ , the effective angle of attack appears in the light of experience CL/  $(2\pi$  0.91) and the

geometric angle of attack is the sum of these two angles CL - CL - + - - -. The efficiency in question is the ratio of the  $\pi a - 2\pi$  0.91 effective angle to the geometric angle, and hence becomes

w — 1 1+1.82/a

This satisfies us concerning the shape of the lift curve below the burbling point. Beyond, there exists hardly any general rule and we have to rely on experience and on good luck in each case. The angle of attack of zero lift agrees well with theory. It was given by the average direction, which again was determined in the simplest case by connecting the trailing edge with the point of the mean camber line at 50 per cent of the chord. With a section having a pronounced "S" shape of the mean camber, it may become necessary to use greater accuracy. The rear edge is then connected with the two points at 11 per cent and 89 per cent of the mean camber line and the angle formed is then bisected. That gives a better or more nearly correct average direction, which is the direction of zero lift.

We proceed to the discussion of the burbling point. This burbling is not predicted by theory, and one might be led to believe that theory leaves us helpless in this question. This is not quite the case, however. It cannot indeed give us an exact rule for the computation of the maximum lift coefficient, for such a rule does not exist. Not even a measurement will give the exact value of the maximum lift coefficient because there is no such value. The burbling point is somewhat of an indefinite quantity. Tests made with the same wing model in different wind tunnels, or under different conditions in the same wind tunnel will generally give different burbling points. It is further known that tests with small wind (Continued on page 114)

# THE 1931 RHOEN SOARING CONTEST

## at the Wasserkuppe

By J. K. (JACK) O'MEARA

While the Wasserhuppe Contests are an international event, America has never before made an entry, This year, through the courresy of Asso Dueser and Pite Sourssank Pluor, it was made possible for Jack O'Meara to represent the United States. Mr. O'Meara flew a high-performance soaring plane which had been completed only a few days before his arrival. Conditions were such that his flights during the contests were limited. Nevertheless, he soared for five hours and forty-five minutes, attaining during this flight an altitude of 3,500 lect, which is believed to be a new unofficial altitude record for an American glider pilot. He flew a total of ten hours in seven flights.

HE Twelfth Annual Soaring Contest, held in the Rhoen Valley, Germany, from July 22nd to August 5th, under the auspices of the Rhoen Rossitten Society, brought together the world's foremost soaring pilots on the Wasserkuppe. Here, especially in the past four years, considerable progress has been made in the art of motorless flight and in the construction and design of soaring planes. This year there were no new machines, nor were there in evidence radical changes in the design of the competing machines; the greatest achievement was the display of the improved skill by the pilots with knowledge and experience of a high degree. The number of machines and pilots was much larger than in previous years. As it was expected, the greatest distances and altitudes generally were attained in flights made during thunderstorms. However, I believe the most important flights of the contest were the distance flights

made on thermal currents alone.

The contest began with fifty-nine entries. A total of more than 400 flights was made. For the first time in the history of the contests, airplane-towing flights were included. Up until July 25th, no record flights were made; on this day a thunderstorm arose, though unfortunately late

clouds gathered on the horizon in the west and lightning flashed in the distance; as the storm drew closer, the thunder grew louder and more frequent and there was no doubt that here was a much desired line-storm with a front extending across the sky. The warm, stagnant, air was swirling up in front of the cold front of the approaching storm, giving the upcurrents favorable for long-distance flight. As the sky became overcast and darkness increased, the flashes of lightning were more frequent and the thunder crashed heavily. five-thirteen o'clock the first pilots took off and in the next seven minutes twelve soaring planes had been launched. They quickly climbed into the head of the storm front. The craft flew immediately in front of the clouds, carried up at a high rate of speed. To fly in safety in these conditions takes the utmost skill of a pilot and requires the finest built machines to withstand the tremendous strains upon their wings in the turbulent air currents caused by the onrushing storm center. Soon the machines became mere

in the afternoon. At about four p.m., dark, turbulent

Éventually, pilots began to telephone in reports of their flights after landing. Groenhoff, pilot of the Fafnir, reported a landing at Meizenforf near Magdenburg, 220 kilometers (136.7 miles) from the Wasserkuppe. On the flight he reached an altitude of 2,050 meters (6,726 feet) and remained in the air for three hours and fifty-one minutes. The landing was made under the difficulties of darkness in an extremely small landing field. He exceeded the former record of 164.5 kilometers (102.2 miles) made by Robert Kronfeld at the contest last year.

specks in the sky and when the downpour of rain began,

they were entirely out of sight.

Wolf Hirth in the Musterle reported a landing near Friedensburg, near Halle, a distance of 175 kilometers (108.7 miles). In the course of his flight he reached an altitude of 1,700 meters (5,577 feet). Hurtig, flying in a "Westprussian", made a flight of forty-two kilometers (1,000 meters) and the property for miles). Landing present

(twenty-five miles) landing near Kieselbach.

It is a cause for regret that Kronfeld, famous for his long-distance



J. K. (Jack) O'Meara, first pilot to represent the United States in the Rhoen soaring contests at the Wasserkuppe



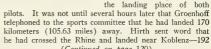
Groenhoff and the Fafnir in which he accomplished a number of outstanding flights at the 1931 Rhoen meet

certain distance from the top of the mountain. Groenhoff in the Fafnir was first to take off. He was towed by a German "Flamingo" at a speed

of approximately sixty-five miles per hour. Cutting loose from the plane, he spiraled under the cumulus clouds. The other pilots were towed up. Soon there were seven ships in the air. One pilot flew too low, was caught in the down-wash behind the airplane and forced to release. Only Kronfeld, Hirth and Groenhoff finally remained aloft. They landed in close succession. Kronfeld remained up one hour and fifty minutes; Groenhoff, one hour and fortytwo minutes, and Hirth, one hour and thirty-seven minutes. This was the first time that aeroplane towing had ever been tried in a contest at the Wasserkuppe and the results proved that soaring can be accomplished even though there is not enough breeze for a shock-cord take-off,

The next day more than 60,000 people from all the small villages and near-by country gathered on the mountain; they came in buses, motorcars and on foot, wearing the characteristic hiking costume with short pants and "ruck sack." They were intent upon seeing all there was to see and enjoying themselves generally. During the morning, pilots of the Junior group made thirty-five starts. The

longest flight was one of two hours and thirty-four minutes. Pilot Mayer, flying the Aachen, reached an altitude of 850 meters (2,778.8 feet). By noon, cumulous clouds began to form and shortly afterward Wolf Hirth took off. flying the Musterle. He was followed by Groenhoff in the Fafnir. Hirth spiraled up under a new forming cloud and in a very few minutes was lost from view at a high altitude. Groenhoff, too, disappeared and for the next few hours the crowd speculated on



(Continued on page 120)

flights, holder of the Wasserkuppe record made during a thunderstorm on the previous year and the first pilot to take off under such conditions, was prevented from flying because his machine, the famous Wien in which he recently crossed the English Channel and made many long-distance flights, was being re-covered. The wings were badly

wrinkled after they were wet in one of the frequent rainstorms on the Wasserkuppe.

The longest duration flight of the contest took place when Pilot Schnud of the Junior Pilot Group, flying a "Professor", took off on the morning of July 28th and flew for eight hours and fifty-nine minutes. This was an important achievement because Schnud was a Junior and his previous soaring experience in competition was limited. During this flight the pilot rode out many lulls which usually terminate an endurance flight.

Kronfeld returned to the contest with his Wien on the morning of July 30th. He flew for six hours and fifteen minutes on a combination of extremely low deflected currents of wind and thermal up-movements which he found in some unaccountable way over certain places that were warmer than others. During the day many pilots took off after watching him fly back and forth over their heads. only to land at the base of the mountain a few minutes later. Wolf Hirth made two attempts, flying for twentyfour minutes on one flight and for two minutes on the other. Groenhoff was forced to land after thirteen minutes in the air. This masterly flight clearly revealed the ability of Kronfeld when flying under these particular conditions. Thermic soaring is considered by authorities as the acme of sail-flight.

August 1st was a clear beautiful day with practically no wind. At noon the contest committee decided, due to the cumulous formations floating over the Wasserkuppe, that an airplane-towed-start contest would be tried and the

machine would win that remained in the air the longest after being released at an elevation of 1,500 feet. The landing was to be made within a





View of the Wasserkuppe, showing the take-off area in the foreground and the school in the background

## **OUR READERS AIR THEIR VIEWS**

C. T. Austin substantiates his belief that air express would be a profitable enterprise for any transport operator:

Airlines have finally got their passenger carrying systems worked out to the point where it doesn't take a sleuth to get information on their service. But air express is still bogged down in poor management.

Try to send a package by air express! In the first place, you won't be able to find anybody, even at the airline terminal, who can tell you how to do it. If you are lucky enough to get it sent, it's a cinch the bill will look like the national debt after prohibition.

Why is it that it costs, over the same distance, \$1.60 to send a pound of brick which occupies little space; \$1.55 to send a pound of letters which occupy a great deal more space, and ONE AND TWO-TENTHS OF A CENT to transport a pound of man who certainly occupies a great many times more space for himself alone, to say nothing of the breathing space and leg room necessary?

If railroads can see a profit in volume of man with the attendant risks to human life, and if the very existence of the airlines is assured by the transportation of mail at 150 per cent over regular rail rates, why then can there not be a profit in express at 100 per cent over land-line rates?

Operating costs cannot be advanced as an argument against such an arrangement. It is absurd to maintain that an express liner need operate at anything approaching the cost per ton-mile of a passenger plane. There is no defense for the idea that engines must be hung all over the express plane like candles on a Christmas tree or that silversmiths need be employed to build the hangars and loading platforms. One engine, carrying its maximum load, would obviously burn less fuel than three or four engines. Furthermore, the price of the freight plane would be less than that of the present transport plane.

Nor is it necessary to sacrifice speed. Speed is principally the elimination of parasite drag. Some may contend that the fuselage of a passenger plane is smaller than a freight fuselage would be for the same wing loading. But it would be a difficult task to demonstrate to anyone connected with engineering that wing loading on a freight plane could not be materially increased, the pilot being permitted to wear a parachute and bail out when in doubt. The risk would be no greater in such a plane than in the present passenger plane.

You ask what sort of merchandise would be transported. About the same as the present railway express transports. It is not a question of what freight. It is wholly a question of whose freight and how badly that freight is needed. If

the merchant, for instance, could carry a small stock and replenish it quickly avoiding large investments and storage costs, isn't it logical to believe he would do so? That is only one example of the possibilities of air freight. There is no need to worry about patronage.

The air transport business is comparable to motor boating and yachting. People use that means of transportation for pleasure only where they find docking facilities. It will be a long time before we have a boat landing beside each private garage in America. It will also be quite some time before we find a landing field in each back yard. In the meanime, the motorboats are doing quite well carrying cargo as well as passengers. Airplanes would do well to follow their example.

B. Wetherall of Australia corrects the impression that the Southern Cross has been laid on the shelf, even though the report named the 'retirement one of honor.'

In the AERO DIGEST for March, page 114, with reference to Australia, it is stated that the airplane "Southern Cross" has been placed on permanent exhibition in the Sydney Museum.

As a matter of fact, the plane is still in use. It has been used regularly on the Australian National Airways mail and passenger service, and was used by Kingsford-Smith to rescue the first England-Australia air mail from the wrecked British plane.

While there is no doubt that the "Southern Cross" is worthy of a place in any museum, that time has yet to come, and in the meantime, the old plane is still carrying on.

In conclusion, may I add that in my opinion, the AERO DIGEST is the finest aeronautical magazine in the world.

Edwin S. Pink casts his vote for more parachute jumps despite the views aired by earlier writer:

I am a peaceful person and as a rule do not seek arguments but I must pass comment on Miss Elsie J. Miller's article about eliminating parachute jumps, which I read in your August issue.

Miss Miller says: "But how needless it is to risk one's life any more than is necessary by jumping when there is no cause!"

I have always been led to believe that a parachute is an aerial life-saver and 100 per cent efficient. If so, where is the risk involved? I have made several of these exhibition jumps, some of them in the days when only one chute was worn, and have seen hundreds made by my friends and we are all still quite alive. However, this has little to do with why they should *not* be eliminated.

To begin with, if a parachute is merely a safety device and is used for such exclusively, how will all civilian pilots know that it is safe? Until the last three or four years parachutes were known to the army and navy but the civilian heard little of them and saw less. Strange stories were circulated about them and their failures. Civilian pilots were afraid of them and would not wear them. Then came the growing appearance of the exhibition jumpers, who have introduced the parachute to all parts of the United States and have demonstrated again and again its efficiency and dependability in saving lives. Even yet there are the doubtful who require a demonstration to be convinced. Why not educate the public to the point where all persons engaged in any type of flying will wear an aerial life-saver and not be afraid to use it? It can be done only by exhibition jumps!

L. B. Barringer raises a dissenting voice to proclaim gliding a sport for all, entailing little labor and little time spent in ground work:

I have read with a good deal of interest the letter of Mr. Paul N. Hepburn of the Los Angeles Glider Club. Although I agree with him on his views about government regulation, I was more interested in his description of how his club went about their gliding activities.

He speaks of the great physical strain and amount of work necessary for each flight and the fact that they are able to make only four two-minute flights per hour. He also states that four men are needed to carry on this operation.

For the past year I have been conducting the Wings Glider School at this field with very great success. I have taught sixty-eight students in that time, many of whom are busy professional and business men who would never have been attracted to gliding had it entailed as much work as Mr. Hepburn describes. Our advanced students make flights 600 feet high lasting about two minutes and are able to make ten to twelve of these flights per hour, without ever getting out of the glider. The only crew is the driver of the car (myself).

We have never used shock cord due to the danger of instructing with this method. The car, rope, and glider are all the equipment we need. We use Waco gliders of both primary and advanced type, although all the high flights are made with the so-called 'primary.' The "advanced type" we use for training a student to make airplane take-offs and landings preparatory to taking up powerplane instruction.

## COMPASS SWINGING AFLOAT

S a general rule the swinging of airplane compasses afloat is not to be recommended. Only under the most favorable circumstances can it even be attempted, and

### By Captain Leslie S. Potter when the plane is heading (by the same

then it is not as accurate as it would be were the same compasses swung ashore. A skilled compass adjustor is needed to effect any sound results, as this is the type of compass swinging which-with the possible exception of airship compass swinging-is the most difficult to carry out, and incidentally, one in which the least experience has been obtained.

It may, however, happen that it will be inconvenient and expensive to take a flying boat ashore for each of its periodical swings. There may be no suitable swinging base near the base of its operations, or no area conveniently situated with regard to local magnetic disturbances to which it can be taken, and in these circumstances it may be neces-

sary to swing the boat while afloat.

Two methods will be described here. Each of these methods is given only as a guide, for it is obviously impossible to lay down any definite rules for an operation which may be influenced by so many circumstances. Factors such as tide, wind, the number of personnel able to assist in the swing, the amount of time available, whether or not the assistance of a motorboat can be obtained, will all influence the decision as to which method is to be adopted. The two methods described may be amended to suit local conditions, or portions of each system may be used in each swing as circumstances dictate.

One method is to select a buoy and from a local chart ascertain the magnetic bearing from the buoy to some prominent stationary object preferably two to three miles away. The annual rate of change of variation for the district concerned should be studied from the chart and allowed for in bringing the magnetic bearing up to date. The boat should then be moored to the buoy and bearing taken either with bearing compass or bearing plate, but preferably the former. It may be remarked that it is impossible for the boat to occupy the exact position of the buoy, and that therefore the bearing from the boat would not be precisely the same; but in this connection it should be remembered that a one degree compass error means approximately a one mile error over a sixty mile flight. Over a distance of three miles-assuming that this is the distance of the object on which bearings are to be taken-a difference of one degree would involve a misalignment of 88 yards. In

consequence if the boat moves in a circle of twenty vards diameter round the buoy-which should allow it ample room-the difference caused through bearings being taken from the boat and not from the exact position of the buoy would be less than one quarter of a degree, which is negligible.

Suppose a Lightship has been selected, "A" in Figure I, and it is known that the

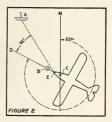
magnetic bearing from the buoy "B" is 327 degrees, and a bearing is taken by bearing compass on the Lightship compass) on a course of 303 degrees.

Suppose the bearing so taken reads 333 degrees; it will be seen that a variation exists of six degrees. Take C as the position of the bearing compass, and it will be seen that the actual direction CA is 327 degrees, while the direction indicated on the instrument is 333 degrees. There is therefore a westerly or minus deviation of six degrees, and this is a deviation existing on a compass course of 333 degrees. The actual course of the boat when its compass was reading 333 degrees was 297 degrees as is shown by the angle NCD.

In Figure II it has been assumed that a bearing plate is to be used instead of a bearing compass and that E represents the position of the bearing plate. Now with DBC as the central line of the plane, the angle NDC will be the compass course (an inaccurate course if any deviation exists). In this case it is 303 degrees, and the angle DEA will be the correct angle by bearing plate of the Lightship from the boat. If these two angles are added together, the compass bearing of Lightship A from the plane will be found. Sometimes it is necessary to add 360 to the sum so obtained, though in this case it is not. In Figure II the angle DEA by bearing plate is seen to be 30 degrees, and this added to the compass bearing of 303 degrees (angle NDC), gives a compass bearing on the Lightship of 303 degrees + 30 degrees = 333 degrees. The correct magnetic bearing is known from the chart to be 327 degrees so that a deviation of -6 degrees (W) exists on a compass bearing of 333 degrees.

There is one other alternative which consists in mounting a landing compass ashore on a site free from local magnetic disturbances, and taking simultaneous bearings from the landing compass ashore on the bearing compass or bearing plate of the plane, and from the bearing compass or bearing plate on the plane to the landing compass ashore. It will be seen from Figures I and II that if a landing compass were in the position of Lightship A it would give a bearing on the plane of 147 degrees, and by taking the reciprocal of this, 327 degrees, as the correct magnetic bearing, the deviation can be obtained. If the plane were in a river or harbor it might be possible to use the landing compass for reciprocal bearings on two or even three sides of the quadrant, but in this type of swinging a clear code of signals must be established between the shore and the plane.

If the conditions are favorable and the boat able to remain steady on a particular course for a short time it will probable be sufficient to take bearings on only the cardinal and quadrantal points, otherwise it is advisable to take them for every twelve or fifteen degrees and plot a curve from the result. The deviation card can then be made out from the curve.



# PERSONAIRLITIES

A NOTHER addition to the select association of pilots who have flown Will Rogers somewhere is Harold J. Kelsey. "Had a great trip in here today over the American Airways passeager line," Rogers wired from El Paso in his message of that day. "Kelsey, the pilot, had flown 400,000 miles without a sign of a mishap."

I guess that's about the finest praise you can give any pilot—400,000 miles without a mishap. Just stack it up against some hero's record for outside loops, and see which leaves the more comfortable feeling in your head. 400,000 miles of safe straight flying—or 400 consecutive loops? Which advances aviation the greater distance? I just



H. J. Kelsey know, it's hard to be nonchalant, even with a Murad, when St. Peter greets you with, "Well, you're here thirty years before

we expected you!"

Say, speaking of St. Peter reminds me of a story that has nothing to do with Kelsey, but while it sticks in my mind I want to pass it on to you. A certain airline executive died and went to Heaven-of course I don't expect you to believe that any airline executive went to Heaven, but this is just a story. St. Peter said to him, "Here's your heavenly home, for all eternity," and pointed out an old shack made of weatherbeaten boards and tarpaper. There were a couple of angels hammering away, putting the finishing touches on this abode, and passing a few comments on the gent who had arrived to occupy it. "He was the fellow who invented that saying, 'The mail must fly," said one, "Another thing he said," remarked the other angel, "was that the weather was pretty bad-but if one pilot couldn't get through, another could."

Just about this time another applicant arrived. He was an old broken-down air mail pilot who has been plugging up and down the line day in, day out, for years—just plugging along and doing his best, helping the other fellow when he could—without too much inconvenience—and if he couldn't help him, he never hindered him, or ran him down, or tried to get his job, or anything like that. Just an ordinary old pilot, he was, and hardly anybody had ever heard of him. But St. Peter looked him up in the Book



and said, "Right this way, Mister, we've got that mansion of yours practically finished," and led the way to a great palace where a whole flock of angels were hurrying around, laying blocks of marble and piling on the gold leaf, and putting in fish nonds and a colf course on the estate.

Well Sir, when the big executive saw that, he asked St. Peter how come that he was only getting a dilapidated old hut to spend eternity in. "Why, friend," says St. Peter. "All we have to build these houses of is what you send up here while you're alive. You shipped us a load of mean actions, and feelings of personal grandeur-and there they are, built into that hut. This old pilot here sent us enough material, such as kindly, helpful acts, to put up that palace with. Well," says St. Peter, sauntering off, "I hope you both like your houses, because you planned them yourselves." If that story isn't true, it ought to be. I know people who will be lucky to win a tent.

This reliable old Kelsey, who got sidetracked when I started for Heaven three paragraphs back, can now shunt himself out on the main line so we can get a good look at him. He's an old railroad man who was switched to this earthly division on April 29, 1891, at Winfred, South Dakota. He got up steam and pulled out for Madison, S. D., to attend grammar school, and then rolled along with the Jackson local to visit the High School at Jackson, Minn. At the age of thirteen he was holding down third trick as telegraph operator, where he got his first railroad experience. He recognized very soon that he didn't need to go to college in a raccoon coat in order to work on a railroad, so at the age of fourteen he began pounding the rails as a brakeman on the Chicago, Milwaukee, and St. Paul. But he soon got tired of riding in back, and got aboard the locomotive, first as a fireman and then as an engineer, serving in those capacities for three years.

At the age of seventeen, Kelsey became a conductor on the C. M. & St. P., working out of Aberdeen, North Dakota. In 1915 he enlisted with the Canadians, took flight training and soloed, but because his wife put up strong objections to a man with two children fighting in a war he hadn't started, he returned to the United States and again

took up railroading. His daughters, Mildred and Ethelyn, by the way, are now sixteen and eighten years of age, respectively. Considering the children, I think his wife showed better judgment in getting him out of the army than he had displayed in getting himself in. That war was for single men only, or for married men who were desperate for a vacation from warfare on the home front.

In 1920 this old railroader went to California and again took up aviation, barnstorming with a fleet of three planes until 1928, when he went to work for Standard Airlines, Inc., later purchased by Western Air Express. He became one of the original four pilots on Western Division route of American Airways, in October, 1930, and has flown continually for them since that time. He has over 4,500 hours in the air. all of them, I understand, right side up. This, I believe, is contrary to the very snappiest aeronautical procedure, but has much to recommend it in that the pilot almost invariably travels a long distance without coming apart.

THERE'S a very rare species of bird that you don't often see flying around, and that is the Sportsman Pilot. But by careful conservation the species is increasing steadily in numbers. It makes its nest in banks, factories, and landed estates,

where it hatches out the financial eggs necessary to the procurement of airplanes.

E. E. Greiner is a Sportsman Pilot, though on the side he is secretary treasurer of the Little-Greiner Flying Service, Inc., of Springfield, Ohio. He is also vice president of the Lagona - Citizens National Bank, of Springfield, and treasurer of the Builalo-Springfield



E. E. Greiner

Roller Company — manufacturer of snap rolls, I suppose. What we need in aviation is more bankers and less brokers.

Mr. Greiner was born in Buffalo, N. Y., in 1893. Elis conduct during childhood, he tells me, was only fair, and as a student he declares that he was the poorest in school. Chat's why he now owns pieces of banks and factories. That's a funny thing, too. Did you ever see the smart boy at school by

amount to anything when he grew up? I recall several boys who used to lead the class when I was going to school. None of them ever got anywhere. One is now a school teacher, another is a preacher, while another failed as a lawyer and, of course, ended up as a judge. He was just beginning to make money when they started to investigate him, and now he's traveling. The dullest boy in school-even I was ahead of him-gave up in despair at the eighth grade, and went to work. As it turned out, he didn't need to be smart, anyhow, because in some mysterious way he gradually collected a pickle factory around him, and has several college graduates working for him. If he ever wants to know anything, he can ask them. That shows the advantages of a college education-you can always get a job working for someone who never bothered learning anything.

E. E. Greiner was always a Sportsmanhe got married at the age of nineteen. As a golfer he holds seven cups, and shot eighteen holes at St. Augustine, Fla., in 68. In 1912, he played tennis in the Canadian Internationals-and got no place. But he rated one goal in the United States Polo Association, and won the Greenwood Hunt & Polo Club crap-shooting trophy in 1929. No. that was a trap-shooting trophy, but I suppose he won the other one, too. He took to the sea and helped sail the schooner, Azora, from New York to Santander, Spain, for the King of Spain's cup in 1928. Then he took to the air and got his private pilot's license in 1929 so he could fly his own Travel Air. He made the inaugural trip to Los Angeles and return on the T. A. T. in July, 1929. And he's been flying ever since.

ERE'S the sad story of Al Whitney, who started flying in 1925 and made such progress that by 1931 he found himself and his OX Travel Air "sitting on a five-barred gate," as the song goes. Or a barbed wire fence, I believe it actually was. He was fly-



Al Whitney

some seven miles east of Medina, and in a few moments they were giving a spirited portrayal of the average Senator-sitting on the fence. The flight was continued by truck.

Al Whitney got off to a rather unfortunate start in early life. He went to the same art school attended by Clayton Knight, and hence had his mind turned in the direction of creative art, when if he had gone to a different school he might have become a plumber and lived happily ever after, sending back for his tools. However, the idea of drawing things became an obsession with him, and he went next to the Mechanics Institute and finished at Art Students' League, New York City.

He was now fully equipped to depict practically anything, from children delightedly taking cod-liver oil in search of vitamins, to old gentlemen contentedly munching bran to boost their internal activities. In fact, during the past eighteen years Al has been one of the bright boys known as Idea and Creative Men in the Advertising Profession, Day after day, year after year, he has sat at a drawing board knocking splinters off with his head, thus stimulating his mental processes and the continued production of wood products. He is now with Campbell-Ewald Company, Detroit.

For diversion he has flown airplanes, starting in 1925 in a Jennie, graduating to the dignity of a Hisso Standard with warped trailing edges, and then on through Eaglerocks, Wacos, Fairchilds, Fleets, and finally to the Travel Air and the fence. He tells me that when the list of those who have contributed to aviation is compiled, his name should not be omitted, for if he could get a rebate of what he has spent on flying he would be able to retire. As it is, he's just another willing sacrifice to the cause of aviation

Al very kindly presented me with a fine water-color of his Travel Air flying over the good old State of Ohio, which is especially appreciated because I spent many hours and flew many miles in one of the first of the Travel Airs, with my unfortunate friend, Dan Sayre of Boston paying the bills. I sold only enough of them to pay my expenses and leave Dan no profit whatsoever. However, I did bring back the airplane uncrashed, which is more than three other bold salesmen of Dan's accomplished, so he came nearer to making a profit on me than anyone else he hired. Dan would have been away ahead of the game financially if he had simply asked Al Whitney to paint him a few pictures of airplanes.

W ELL, folks, here's my chubby old Irish pal, Mike Doolin, gone high hat and Agua Caliente. He now signs his letters "Mique," after the old Spanish custom, and I presume is addressed in all the bars across the Mexican border as Señor Mique. He visits those sinks of iniquity, I should add, only during his sociological expeditions, and for strictly scientific reasons. For Mique is nationally known as a staunch worker in the blessed cause of temperance. and for years was exhibited by the late P. T. Barnum as the only living specimen of non-alcoholic Irishmen in captivity. His extremely ruddy complexion and red nose are due solely to a lifetime spent in the open air. If he sued his nose for slander, I'm sure he could collect heavy damages.

In the days when Don Miguel Mique



Mique Doolin

was plain Mike Doolin, he had all the rough-and-ready boisterousness of the average Irishman-which is to say, the playful proclivities of a particularly healthy and skittish rhinoceros. His friends despaired of Mike's ever attaining that air of culture, bon homie, and pate de foi gras, so necessary to one who would fly for the Standard Oil Co. of California. However, one season only with the cultured Mr. Chadderton, late of Bond Street, Piccadilly, and possibly Hammersmith, was enough to do the trick; and now we see this raw Irish lad, fresh from the peat bogs, bowing and scraping to the ladies at our National Air Pageants with all the gay insouciance of a Virginia Byrd fresh from the Poles. You'd think, to look at him now, that he hadn't been raised on pig's feet and potatoes, at all, at all.

The early history of Don Miguel Doolin is obscured by time. That he was born and partially educated, we may take for granted, though the place of his birth is unknown to me. Research shows that there was a tidal wave on the Southern coast of Ireland in 1886, an eruption of Mt. Vesuvius in 1876, and an earthquake in New Zealand in 1866, for any one of which he may be blamed under the certainty that the arrival of a Doolin was almost sure to be accompanied by some violent demonstration of Nature, trying to shake him off the earth before he grew too big to manage, as most Irishmen do eventually-a fact the English have discovered-"An' bad cess to thim!" as my sainted grandfather, the Reverend John Cassidy, frequently remarked when drunk.

History first takes note of Don Miguel in 1913, when he is recorded as blacking an eye belonging to the prexy of the student body of the Berkeley School. Doubtless the Irish in him had come out long before, but not until that time, when he was still a ruddy schoolboy, did the historians take him up and set out his life from then on for the world to admire and marvel at. However, there have been so many conflicting accounts of the Life and Times of Mike Doolin, that I wrote the old bog-trotter himself and asked for his version-and here it

"In answer to your request for a confession of my past sins committed in the name of aviation, I am forwarding herewith about the only picture I can find. It looks more like I am attempting to double for Paul Whiteman or give a testimonial for 'Patties persuasive pancakes, they round out your personality.'

"As for past history. On or about the summer of 1913, as a ruddy schoolboy, I built, concotted, or evolved a cross between a box kite, a Wright Model B, and an anaemic seagull, (with no visible means of propulsion) and jumped off a young hill behind the well-known University of California. The landing (or should I califarrival?) involved a cow, and the result was a fine mess—that was my initiation into the realm of the birds.

"Later I enlisted in the well-known Signal Enlisted Reserve Corp, Rockwell Field -got my R. M. A. the end of 1917 and was rated 'Pursuit' with 29 hours, 25 minutes in a JN 4B (isn't that a laugh?). Went overseas March 4, 1918, and, as usual, to Issoudun. The first aeroplane I saw in flight there was a Monosoupape Morane, being flown by an instructor who was diligently trying to see if he could snap-roll without quite touching the ground (and I damp near deserted). However, I finally got through Issoudun, took my gunnery at Cazaux, did a little Ferry piloting out of Orly, helped support the American bar in Paris, and finally arrived at the C. A. S. office, 1st Army, Toul, on Aug. 2.

"Was assigned to 22d Squadron of the Second Pursuit Group, and from then until November 3 was alternately bombed and scared to death, and flew and was scared to death, also spent a couple of days on the front on the ground with one of the gang, a nonchalant ex-ambulance driver, and was completely scared.

"They must have found out I was of no use by the end of October, because they ordered me home as an instructor in combat, and thank God, the war ended while I was coming home or they would have found out all about me if I had started to instruct.

"Since 1919 I have flown anything and everything that anyone would trust in my hands, managing to get in about 100 hours a year until '24. Went back in the Reserve at that time and got a little more time. Finally went to work for the Standard Oil Co. of California in the newly created Aviation Division and since then have been dashing madly hither and yon in a good old Boeing 40-V, or a Ford, or a Stearman, or what have you."

Thus endeth all that Mique will admit. He's a great old lad, and adds cheer to any gathering he joins. If we had more like him, my friends, the world would be a gayer and a happier place. Long may he live to sail serenely about the skies in "Standard of California No. 3" and distribute Stanavo seat cushions at Air Races, all of which he attends as a Paid Watcher. I've said many times that it takes an Irishman to live without working, and get paid for doing it. There are only a few of us left, Mique, excluding the rest of Ireland on the Police Force.

Y OU can tell by looking at his picture that D. B. Colyer, vice president in Transport, started life as a school teacher. This photograph was taken a moment after he had inquired of his class, "When was



D B Colver

Run, and why?
Who was Sitting
Bull, and where
was he sitting?
And what relation,
if any, was Sitting
Bull to Standing
Cow? Answer me
that!" You can
see the happily expectant look on his
face, can't you?

Not receiving a satisfactory answer,

Colyer joined the Bureau of Railway Adjustment of the Second Assistant Post-master's office in 1917, and the same year enlisted as a Flying Cadet in the Army Signal Corps. After receiving training at New Jersey, Florida and Texas fields, he was appointed a second lieutenant, and in 1918 was discharged as a Reserve Military Aviator.

D. B. re-entered the employ of the Post Office Department and was field clerk at the Washington terminus of the nation's first air mail route, the New York-Washington line. He was advanced to division clerk and later field manager. After brief service as division superintendent of the Washington -New York - Cleveland division, he returned to Washington as chief of flying and then became assistant superintendent of the eastern division with headquarters at Chicago. Transfers took him to Newark, Omaha, Chicago and Rock Springs.

In 1926 he became assistant general superintendent of the air mail service with headquarters at Omaha, and returned to Washington that fall in the same capacity, and later was appointed general superintendent of the air mail service.

A few months after this appointment Boeing Air Transport, Inc., was organized to operate the Chicago-San Francisco route and D. B. resigned his position as general superintendent of the air mail service on April 15, 1927, to become superintendent of Boeing Air Transport operations with head-quarters at Salt Lake. He was advanced to the position of vice president in charge of operations January 16, 1929.

Keeping planes going over the longest regularly operated air line in the world, with daily service, when half the distance flown is at night and much of it over mountainous country with considerable fog flying, is a job which taxes the skill and ingenuity of the most experienced operator,

This brief history shows the heights to which a school teacher may rise if he's only smart enough to stop being a school teacher. Lots of school teachers get on, but they have to quit teaching school first. Look at Woodrow Wilson—he had to quit Princeton to get anywhere. And the late President Eliot of Harvard—he'd have been un-

known to fame if he hadn't discovered the Five Foot Shelf. And who would have heard of Glenn Frank if he hadn't become a newspaper columnist? And like enough we'd never have heard of D. B. Colyer if he hadn't grown sick and tired of listening to wrong answers. Teaching school is good training for a man. After a few years of it almost any other occupation comes as a relief. And, if you notice, once out, none of them ever goes back. The most useful thing a school teacher learns in school is to move on to where the going isn't so tough.

ERE'S Johnnie Martin, pilot with American Airways, Inc., southern transcontinental, western division. He was born in Los Angeles, Aug. 17, 1898, and early succumbed to the influences of that fair climate. Having been born to climatic



Johnnie Martin

perfection, nothing less worth while would suit him, so he has never bothered with anything east of El Paso, I don't Texas. know but what you're right, John, Having battled through many winters in New York. Ohio, Massachusetts, Nova Scotia, England, Belgium.

Germany, and France, I am in a position to assure you that you may pass up all of those sections as not worth while except in the summer. You might try Florida—I understand there is an argument on between California and Florida as to respective merits—but any places I've wintered in needn't be investigated further. They're hopeless, everyone of them. If I was half as smart as a wild duck, I'd be south every winter.

The only thing that makes me resigned to New York's climate is the constant assurance I have that if I succeed in surviving here I must be extra tough. A sunsoftened bird like yourself, Johnnie, could never stand it. First thing you knew you'd start to moult and lose your moustache—if a moustache, isn't it? I thought everything was supposed to grow so big out there—or was that only melons in the Imperial Valley? No matter.

Johnnie Martin started flying in Santa Ana, Calif., in 1922 with his brother Eddic. They started the Martin Brothers school—later The Eddie Martin Airport, which is still in operation. In 1928 Johnnie became affiliated with the Geo. Leonard Flying School at Long Beach, Calif., and early in 1929 became a pilot for Standard Airlines. In April, 1930, he went with Western Air Express. In October, 1930, he became one of the original pilots on the newly inaugurated southern transcontinental air mail, C. A. M. 33, and passenger route of American Airways.

# DONT

# FLY ANOTHER WINTER WITHOUT AIRWHEELS

OST of the year's worst weather comes in the next five months.

You may be able to pick your ground conditions at the start of a flight—but nobody knows what you'll find when you come back to earth again.

Play safe — with the only wheel and tire equipment soft enough to land safely on mud or snow. Equip yourself with Goodyear Airwheels.

The cost of Goodyear Airwheels and the new Airwheel roller bearing brakes is almost exactly the same as you'd pay for wheel and tire equipment far inferior in safety.

They're worth having, just for their protection in emergency landings—but they mean easier flying, and they save your ship in everyday service.

Ground loops are almost impossible—you can get far better take-offs and landings with Airwheel brakes—cross-wind or down-wind landings are easy—you save your ship from the vibrations of taxiing over rough fields—when you have these big, soft, rolling rubber pillows between you and the ground.

Only Goodyear can give you Airwheel safety. For full proof of what Airwheels can do—write to Goodyear, Akron, Ohio, or Los Angeles, California.

WHEN YOU BUY A NEW SHIP SPECIFY GOODYEAR AIRWHEELS



EVERYTHING IN RUBBER FOR THE AIRPLANE



## DEARBORN INN AT FORD AIRPORT

A WORTHY complement to the Ford Airport was established recently when the Dearborn Inn, probably the first modern hotel to be located adjacent to an airport, opened its doors to the public.

In the early development of aviation, the Ford Motor Company interests looked far into the future and built an airport which was at that time the first modern airport. The increase in air travel from year to year indicated to William B. Mayo, chief engineer of the Ford Motor Company, the need for lodging for air travelers comparable to that afforded in other means of transportation. Out of his idea came the forming of the Oakwood Hotel Company, which built the Dearborn Inn. It was leased for operation to the L. G. Treadway Service Corporation, who are operators of several hotels in the New England states.

everal hotels in the New England states. The architecture of the Inn is distinctively early American, a style in keeping with the many buildings of Mr. Ford's new museum and his now famous Greenfield Village, which are also adjacent. A promenade has been provided on the roof which will afford the guests an advantageous view of the airport and its activities.

The main lobby is similar to the beautiful "parlors" of the wealthy New Englanders, except for the walls, which have been painted in a panorama of early American history. Each piece of furniture is an exact copy of early New England design. The ladies lounge is also distinctly New England and has become very popular with Detroit society women as a setting for an afternoon bridge.

The 108 guest rooms are arranged so that they can be had either single or en suite. Though the rooms vary in color and furniture design, the New England theme prevails throughout. Each room

has a modern bathroom, and is equipped with a radio set.

Table d'hote is the mode in the main dining room, but a la carte meals may be had in the old-fashioned coffee shop. The food has the flavor of famous New England menus, for the chef comes from that region of the country.

Only in the kitchen will one find the ultra modern. The equipment includes large automatic refrigerators which resemble safety deposit vaults, and huge electric stoves, electric potato mashers, dish washers and other such kitchen aids. All are finished in new non-tarnishable metal.

Several Detroit people are now resident guests of the Inn, and visitors to Mr. Ford's interests are finding this a haven for lunch. Many of Detroit's foremost society people are numbered among the guests who dine at the Inn each night.







Views of lobby, lounge and guest room in Dearborn Inn, Ford Airport's "real New England inn." Furnishings are reproductions of early American pieces in pine, maple and mahogany. Lounge walls depict colonial history of the United States.

**OCTOBER**, 1931

# TEXACO AVIATION GASOLINE FOR AMERICAN AIRWAYS, INC.



THE Southern Lines of the American Airways use Texaco Aviation Gasoline exclusively at terminals from Atlanta to El Paso.

The American Airways operates a nationwide system of air transportation for passengers, express and the United States mails. Its planes are of the most modern type, superbly designed for the safety and comfort of passengers. Pilots are in constant touch by radio en route with 200 government weather stations and 65 special American Airways stations. Unusual airport inspection facilities are provided to insure safe arrival at destinations and unbroken schedules.

In line with this high type of service, twenty-four of the American Airways' Southern Air Terminals are stocked exclusively with Texaco Aviation Gasoline. The operating staffs at these terminals are enthusiastic boosters of Texaco Aviation Gasoline.

This super-power gasoline is available at the Country's principal airports and landing fields from coast to coast.

THE TEXAS COMPANY, 135 East 42nd Street, New York City





## INDIANAPOLIS MUNICIPAL AIRPORT

LTHOUGH the 1.000 acre Indianapolis Municipal airport, formally dedicated on September 25-27, has been open only since February, need for a better control system is indicated daily as the traffic increases.

Inasmuch as the port has been recommended to obtain an A1A rating from the United States Department of Commerce, M. G. Johnson, airport engineer, has prepared a dual control plan for present and anticipated development of the field. This plan has been adopted by the Indianapolis Board of Public Works and will be followed minutely. The present flying field is 266 acres: the total airport acreage is 947 acres.

Another unit of buildings and runways. similar to the present administration building and runways, on the east side of the field, is proposed for anticipated development on the north side of the port, adjoining the railroad and the interurban track. These are to be used as commercial and industrial units.

If two control systems are used, one -the east, for instance-could operate transport traffic, and the other could manipulate transient and industrial traffic. Both systems could be operated from the present administration control building

#### $\mathbf{B}\mathbf{y}$ H. Gene Haynes

by lights, or another control tower could be erected to handle the north unit.

Proposed hangars in the anticipated units are located in concentrated areas adjacent to the rear of the control buildings, in order to facilitate the movement of planes to and from the hangars. Traffic will be concentrated near points of operation, since all traffic must naturally pass the point of operation, both for take-off and landing on all runways.

Running lanes of 500 feet minimum width in all directions have been provided in the plan, eliminating obstructions in lanes of travel as development continues. These 500-foot clearance areas will be established even if the dual control system is used.

Minimum running lanes from and to

runways in all directions are one mile in length, inasmuch as all proposed buildings are out of the line of flight. This plan also reduces the taxving distance. since planes can land safely and also obtain sufficient running distance in concentrated areas near the control and service buildings.

Switching facilities from the railroad and interurban line are provided with the proposed unit on the north side. New materials for industrial purposes could be unloaded inside the field.

With little expense, facilities could be provided at the north unit for shuttle passenger, mail and express service to the downtown district in ten minutes.

A state law, passed this year through the efforts of the Board of Works and the Indianapolis City Legal Department. provide zoning authority for the board to protect the airport from industries outside the field, which might handicap flying operations. No factories or other obstructions which will endanger flying by lessening the distance of safe runway lanes in all directions will be permitted to be erected.

The present administration and han-gar building is of brick and reinforced concrete. All runways, taxiways, aprons and drives are of reinforced concrete.

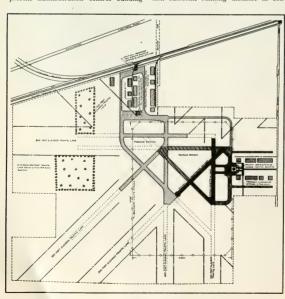
The prevailing wind is from the south, 29.5 per cent of the wind being from this direction. Percentages of other winds are: southwest, 23.7; west, 7.7; northwest, 15.9; north, 4.6; northeast, 10.9; east, 1.3; southeast, 6.4. These figures are based on an average established by the U. S. Weather Bureau over a long period of years.

#### Counterclockwise Circling of Airports Becomes Traffic Regulation

THE circling of an airport to the left (counterclockwise), which for several years has been the general practice at the majority of airports throughout the United States, will become an amendment to the Air Traffic Rules of the Air Commerce Regulations, effective December 1, 1931, it has been announced by Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics.

In cases where local wind or other conditions require circles to the right or right or left circles at different times, it will be necessary for those airports and landing fields to obtain authorization of the Secretary of Commerce to provide for such turns by displaying suitable markings to indicate the direction of

If clockwise turns are to be made at all times, the letter "R" must be displayed in the center of the landing area and if the port is illuminated for night operations, must also be prominently displayed, as on a hangar, and lighted. If left-hand and right-hand turns are to be made at different times, the letter X must be displayed in the center of the circle and R or L, as desired, also placed in an outstanding position.



Plan of Indianapolis Municipal Airport. Dotted line indicates boundary of airport; solid black area, completed improvements; heavily shaded area, first development; gray, anti-ipate development

# TELETYPEWRITERS

#### CONTRIBUTE TO THE GROWTH OF CENTURY AIR LINES, INC.



SAN FRANCISCO
O OAKLAND
FRESNO
BAKERSFIELDO
LOS ANGELESO
SAN DIEGO

DURING its first five months of operation, Century Air Lines, Inc., connecting important mid-western cities, carried 30,427 passengers; while its Pacific Coast service, in its first seven weeks of operation, carried 8000 passengers.

Teletypewriter Service\*, according to officials, has contributed largely to the growth of the company. Airports are kept in constant communication with each other by this modern method. A message typed on one Teletypewriter appears simultaneously in all connected airports and offices.

Teletypewriter Service—typing by wire—is particularly helpful in regulating passenger lists. Persons applying for reservations aboard a Century plane, either at airports or at hotels, can learn immediately what accommodations are available. For example, planes leaving Chicago for Cleveland always have several seats reserved for possible passengers at other points. In the event that the seats reserved at Chicago are not sufficient, one or more of the seats reserved for "pick-ups" is released by Teletypewriter instructions.

Teletypewriters provide a continuous and accurate two-way channel of communication. They are used for the instantaneous transmission of administrative messages, reporting the arrival and departure of planes, and other operation matters. Other airlines and airplane manufacturers have still other uses for them. Your local Bell Company will gladly show you how Teletypewriters might be of similar value to your company.

\*Teletypeuriters are installed in the separated offices of private business companies by the Bell Telephone Company. Messages are reproduced in identical typeuritten form the instant they are sent. The service may be had for any number of hours each day, from one hour upward.



Left: Teletypewriter machines are the heart of Century's communication department. They keep ground crews in constant communication with each other and with the Government radio stations. Right: Century Airliner nearing its home port at Municipal Airport, Chicago.

#### CURRENT AIRPORT AND AIRWAY FACTS

Century Pacific Lines Carries Record Loads During First Two Months

O VER 10,000 passengers, 347,654 revenue miles and 1,814,682 passenger miles flown within two months of operation is the record established by Century Pacific Lines, operating air passenger service connecting San Diego, Los Angeles, Bakersfield, Fresno, San Jose, Oakland, San Francisco and Sacramento. Between July 3 and August 31 more than 56,294 landings and take-offs were accomplished.

Farsightedness of preparation as accomplished by O. R. Fuller, president, accounts for the success of the lines, officials of the company believe. Before the lines went into operation, advantageous rates were established. Colorful inaugural ceremonies at each of the cities along the lines were held to attract the attention of the public. And from the first, Century airliners have flown more than three-quarters of their capacity.

The increase in revenue of Century Pacific Lines for August over July amounted to \$19,378. Additional equipment from the Stinson company has been ordered to take care of the traffic.

#### E. A. T. Places Eighteen-Passenger Condors on New York-Atlanta Line

E IGHTEEN - PASSENGER Curtiss Condors have been placed in service by Eastern Air Transport between New York and Atlanta to alternate in service with smaller Curtiss Kingbirds. The ships began service on October 1.

This improvement in equipment is the result of an 'inspection trip by Thomas B. Doe, president, over the system, which convinced him that the South will support enlarged air transport services. Three round trips weekly between New York and Atlanta will be made by Condors and four by Kingbirds, maintaining the present daily service and increasing the available seats to 148 weekly instead of 70.

#### Air Mail Increases Half-Million Pounds in First Six Months of 1931

SCHEDULED air transport lines operating in the United States and with extensions to Canada, the West Indies and Latin America, flew more than 20,000,000 miles and carried 193,651 passengers, 4.589,707 pounds of mail and 1,299,863 pounds of express during the first six months of 1931, according to the Aeronautics Branch of the Department of Commerce.

The amount of mail carried represented an increase of more than a half million pounds over the first six months of 1930 and express showed 54,386 pounds increase. Passenger traffic, however, showed a decrease of 14,706 over the corresponding period of 1930.

The total number of miles flown in scheduled operations during the first half of 1931 represented an increase of 3,401,702 miles over the same period last year. However, the total number of passenger miles flown showed a decrease from 52,264,616 in the first hali of 1930 to 47,501,901 in the first half of 1931.

#### Metropolitan Air Ferries Adds Night Flying Between New York Airports

M ETROPOLITAN Air Ferries, which recently inaugurated service between Newark Airport, Floyd Bennett Airport, and Glenn H. Curtiss Airport, has announced night flying in response to public demand for added service. Two trips will be made in the evening, one at eight o'clock and the other at nine, starting from Glenn H. Curtiss Airport.

The line carried over eleven hundred passengers on the first week's schedules of these passengers, the majority were out to view the city, but many made connections with the transcontinental airlines departing from Port Newark.



Portable machine shop developed by South Bend Lathe Works, South Bend, Ind.

#### Post Office Department Observes Twentieth Anniversary of Air Mail

THE Twentieth Anniversary of the first air mail flight was celebrated on September 23. American Airways was chosen as the anniversary carrier, and simultaneous commemorative flights were made from Los Angeles to Tucson and from Nassau Boulevard, Garden City, to Mineola, Long Island, N. Y. Earle Ovington, the first air mail pilot, and Dean Smith, American Airways pilot, made the flights.

#### Aeronautics Branch Issues Bulletins for Airport and Aircraft Operators

THE Department of Commerce, Aeronautics Branch, has prepared a comprehensive bulletin for airport managers, engineers and aircraft operators to assist them in airport problems. The bulletin, styled as Aeronautics Bulletin No. 2, is entitled "Airport Design and Construction." All phases of the subject are treated, including selection of the site, construction, lighting, and seaplane airports. The bulletin is adequately illustrated

Other special bulletins recently issued are: Bulletin No. 10, Air Navigation Maps, describing the compilation of the maps and listing those available; and Bulletin No. 3, Aeronautics Trade Directory, listing concerns engaged in production of commodities and in aeronautic activities.

The semi-monthly bulletins of recent date also treat of subjects of interest to airport and aircraft operators. August 1 (No. 3) describes the service of intermediate landing field personnel to airmen; August 15 (No. 4), tentative draft of requirements for aircraft components and accessories: September 1 (No. 5), effects of physical deficiences upon flying activities of licensed pilots and holders of student permits. The bulletins are available through the Department of Commerce, Aeronautics Branch, Washington, D. C.

The Secretary of the Navy has issued a loose-leaf book entitled "Naval Air Pilot," giving detailed information for fliers along the east and Gulf coasts of the United States. It is identified as Hydrographic Office Publication 190. Sections of the book deal with communications for planes in flight, night flying, useful tables, Coast Guard stations and publications. Small maps of prominent airports in each state are included.

#### Ludington Opens Sixty-eight Minute Washington-New York Service

HIGH speed service between New York, Philadelphia and Washington was inaugurated September 16 by the Ludington Lines, when the first of their new Lockheed Orion transport planes opened sixty-eight-minute service between Washington and New York.

The plane, a low-wing seven-passenger transport ship with a retractable landing gear, and capable of a top speed of over 200 miles an hour, will maintain what will probably be the fastest airline schedule in the world. Four round trips each way daily are scheduled.

#### Mountain Gorge Equipped with Beacons to Permit Night Flying Over Route

A LIGHTED lane for aircraft, fifty miles in length, running through a deep gorge between mountain walls and heavy forests, is now ready for airmen to fly at night, between Portland, Oregon and Pasco, Washington, on the Salt Lake City-Seattle airway. This gorge is at times virtually a tunnel, yet it is the most desirable aircraft route in that section.

Airway electric flashing code beacons are mounted at twenty-one sites on both sides of the gorge at prominent locations so that airmen need only follow the course outlined by the two lines of light in order to fly safely through the gorge. Green lights are on the Washington side of the gorge and red lights on the Oregon side to provide proper orientation by airmen passing between red and green lights.

(Continued on following page)

# **World's Largest** Amphibian

IGOR SIKORSKY, designer, (left) and Capt. Boris Sergievsky, pilot, stand-ing beside one of the Amphibian's huge Goodrich Airplane Tires. This tire is almost five feet high, and more than a foot in thickness.

CHOOSES GOODRICH Giant Goodrich Silvertown Airplane Tires safeguard take-offs and landings . . . 80 tons. Tires built by Goodrich! Goodrich Low Pressure Tires are the first choice of airmen the world over. Because they make take-offs and

ORE powerful than a locomotive - accommodating forty-five passengers with all the luxury of a palatial hotel-capable of traveling 130 miles per hour! That's avia-

tion's latest marvel-the new Sikorsky Amphibian built for passenger service between Miami and the Canal Zone.

Consider the terrific impact the huge tires pictured above must cushion when this mighty craft makes a take-off or landing. Naturally they're the best tires that engineering skill could devise. Tires capable, by test, of withstanding a blow of more than landings easier and safer-because they can be easily and quickly installed on any plane, with or without brakes, you should insist on Goodrich Low Pressure Tires.

Phone your nearest Goodrich Dis-

tributor or write to the Aeronautical Sales Department of The B. F. Goodrich Rubber Co., (Est. 1870), Akron, Ohio, or Los Angeles, California.

# RUBBER FOR AIRPLANES

unother B. F. Goodrich Product Shields Tail Wheels Hose Tubing Engine Mounts Crash Pads Accessories

#### United Air Lines Operates Over Longest Lighted Airway in World

TRI-MOTORED passenger and mail planes are now operated day and night over the entire length of the New York-San Francisco airway, a total distance of 2,766 miles. This is the longest lighted airway in the world.

The successive steps in the development of the New York-San Francisco route are as

1920—First regular air mail service, daylight only.

1924—Night flying (mail only) over part of the route. 1927—Night flying (with passengers) be-

tween Chicago and San Francisco.

1929—Trimotored transports used for night flying between Chicago and San Fran-

1930—Passenger service extended from Chicago to New York.

1931—Passenger and mail service day and night in trimotors from coast to coast.

A curious fact about this service is that New York is three hours nearer to San Francisco than San Francisco is to New York. Because of the prevailing west winds, schedules of the United Air Lines (National Air Transport and Boeing) allow twenty-eight hours flying time for eastbound planes and thirty-one hours for westbound planes. There are three planes each way daily.

The first transcontinental airway follows approximately the line of the first transcontinental railroad, which was completed in 1869. The route crosses nine states and passes through Cleveland, Toledo, Chicago, Iowa City, Des Moines, Omaha, Lincoln, North Platt, Cheyenne, Rock Springs, Salt Lake City, Elko, Reno, Sacramento and Oakland.

The Department of Commerce, cooperating with the Poet Office Department, has installed 111 lighted emergency landing fields (in addition to the regular airports); 232 twenty-four-inch revolving beacons, and 550 blinker lights. This is the only airway that has a complete United States directive radio beacon service and was the first to be equipped with a thorough weather report service.

#### Local Subcommittees at Twenty-six Cities to study Air Traffic Problems

O RGANIZATION of local subcommittees to study problems of handling air traffic at airports is being effected at twenty-six cities through the United States, with a view to establishing adequate airport traffic control systems. These subcommittees will report their findings to the Aeronautics Branch, which will compile a comprehensive report.

#### Texas Inventor Tests New Wind Cone at Lubbock Municipal Airport

A NEW T wind cone with slip-on covering, overhead lighting and an attachment to indicate wind velocity has been patented by William C. Breedlove of Levelland, Texas. One cone has been installed at the Lubbock Municipal Airport, pending rating and approval from the Department of

The cones are made in three sizes ranging upward from seven feet. By truss formation the weight of the entire structure is pivoted on a thrust bearing which, when covered, gives an arrow formation. The device can be so balanced as to fall with the long way of the field at low winds.

#### S. F. Bowser & Co. Equips 500 Airports With Fueling System

A TIME-SAVING service pit, manufactured by S. F. Bowser & Company, Inc., Fort Wayne, Indiana, and designated as the Figure 230, is a complete fueling system designed for serving gasoline to aircraft on the flying field. It provides facilities for pumping, measuring, recording and delivering gasoline to planes.

The system is furnished in two standard sizes, the smaller with one and one-fourth inch pumping unit delivering 18 gallons per minute, and the larger with one and one-half inch unit delivering from 33 to 35 gallons per minute. Larger sizes can be furnished upon order.



Bowser Fueling System for Airports

Among the features of this fueling system are accurate measurement by the Xacto meter, protection against water through the use of a centrifugal separator, and remote control through a pumping unit located in the hangar and controlled at the pit. Nozzle control of the flow of gasoline at the discharge point affords protection against spilling or overflowing, eliminating fire hazards. The nozzle is fitted with a screen of fine mesh and a slip cap to prevent contamination by dirt and water between serving operations.

The system has a 50-foot serving radius, permitting planes to taxi up for refueling without interfering with planes already in the serving area.

This fueling unit has been on the market about four years in which more than 500 systems have been installed. One of the fields most recently equipped is the City-County Airport at Pittsburgh, Pennsylvania, where eight fueling pits are in operation.

Transcontinental and Western Air Traffic Shows Substantial Increase

P ASSENGER, mail and express business on Transcontinental & Western Air, Inc., all showed substantial increases in August as compared with July, and in addition the new air freight service announced on August 5 has received good support by shippers in the first three weeks of its operation. It is believed that this new service will show increases as soon as shippers become aware of the extremely low rates at which this business is handled, the rates varying according to the size of the shipment to as low as eleven cents a pound for the overnight haul between New York and Kansas City. Shipment of commodities over the line in August exceeded the July poundage figure by sixteen per cent. Air mail poundage increased even more, showing an increase of twenty-two per cent over July. Transcontinental & Western Air, Inc., carried 4,341 passengers, an average of 470 miles, bringing total passenger miles for August up to 2,035,000. Transcontinental & Western Air, Inc., is now flying 500,000 miles a month,

#### American Airways Calls Meeting of Field Representatives

Field representatives of the American Airways were called during the latter part of September to the New York headquarters for a conference on traffic conditions and public relations throughout the country. Sessions were held at the Hotel Roosevelt. Those present were Julian K. Lyles and Kenneth Foree, Dallas, Tex., Southern Division; Joseph Sabin and Ray Whittaker, Chicago, Universal Airways Divison; Carl Anderson and C. E. Planck, Cincinnati, Embry-Riddle Division; Milton Saul, Atlanta. Southern Division, and Ralph S. Maugham, Boston, Colonial Division. They conferred with F. Warren Oakes and Silliman Evans. assistants to the President, R. J. Smith, General Traffic Manager, and Goodrich Murphy and A. L. May of the Traffic Department, New York office.

#### Century Air Lines Carries 7,938 Passengers During August

Century Air Lines carried a total of 7,938 revenue passengers on its various divisions during the month of August, 1931, L. B. Manning, vice-president, has amounced.

During the last five months Century Air Lines has carried a total of 32,701 revenue passengers between Detroit, Toledo, Cleveland, Chicago, South Bend, Springfield, and St. Louis. Century Air Lines is a division of the Cord Corporation.

#### Assistant Secretary Young Begins Aerial Inspection Trip

Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, left Washington during the middle of September in a Department of Commerce airplane for an inspection trip of the Federal Airways System now being established and maintained by the Department of Commerce.

The trip will be over the airways between Washington and the West Coast, OCTOBER, 1931



THE plumes or the tireless muscles and sinews of an eagle that communicate the power of his unfaltering heart are not more to be admired than the bones upon which the whole mechanism depends for leverage. Marvelous framework! Massive at a few points but at others almost as thin as the walls of a straw, and on the whole, light enough to ride the wind without effort, high above the clouds. Yet strong enough to bear every strain that arrow speed, quick reverses, or the rush of mighty storms may impose.

Let one of these bones be broken and the whole miracle of flight comes to grief.

Tubing is to an airplane what the bony structure is to its prototype, the bird. No refinement of engineering, no scrutiny of materials, or application of skill, or control of process can be too great to make it perfect for so exacting a use.

The manufacturers of NATIONAL-SHELBY Tubing, long accustomed to the rigid requirements of the automotive industry have spared no pains to meet also the exacting tubing requirements of aircraft design.

NATIONAL-SHELBY Aircraft Tubing is available through distributors at various important centers. Ask for descriptive literature on NATIONAL-SHELBY—

America's Standard Aircraft Tubing

NATIONAL TUBE COMPANY, PITTSBURGH, PA.
Subsidiary of United States Steel Corporation



# **NATIONAL-SHELBY AIRCRAFT TUBING**

### KEYSTONE PK-1 FLYING BOAT

#### Twin-engined biplane built for the Navy Dept.

HE Keystone PK-1 is a twinengined biplane flying boat built for the Navy Department by the Keystone Aircraft Corporation for use on long patrols and bombing flights over water. Developed from the Navy flying boat PN-12, the PK-1 is entirely of metal with the exception of the fabric covering the wings.

The powerplant comprises two Model E Wright Cyclone engines of 575 horse-power each, driving three-bladed steel propellers. These engines are provided with the new E-shaped heads, spark plug coolers and radio shielding. In preliminary tests, this ship exceeded the high speed of 119 miles per hour specified by the Navy Department.

Planes of this type are expected by the Navy Department to act as self-supporting units in time of war. They are designed to be able to establish independent caches and bases removed from other operating bases and from which they can be operated on their own over a considerable area for patrol work or bombing raids. Through radio communication, constant contact with headquarters can be maintained to receive orders and report activities.

The crew consists of five men as follows: pilot, co-pilot, navigator-bomber, radio operator and gunner-mechanic. When in action the crew is disposed in three compartments: the navigatorbomber in the nose nacelle; the pilot and co-pilot in a compartment in the nose of the hull immediately aft of the bomber; the radio operator aft of the wings in an interior compartment in the hull: and the gunner-mechanic in a nacelle aft of the wings in the hull. A spacious companionway is constructed in the center of the hull, fore and aft, through which communication is provided between the various crew stations. The gasoline tanks are located in the interior of the hull adjacent to the passageway. Total fuel capacity is 800 gallons, sufficient for a cruising radius of 1.200 miles.

Wing span is 72 feet 10 inches; length overall, 49 feet; and height overall, 16 feet 9 inches.

Equipment provided on each of these ships includes the following: hand electric starters for each engine; dual control and duplicate flight instruments; standard navigation lights; two headlights for landing at night; towing tackle for targets; radio transmitting and receiving apparatus; message carriers between the various crew stations; two portable aluminum tanks each containing 4.5 gallons of drinking water; one container of seventy pounds of food; a life raft sufficient for five men; earth inductor compass, drift indicator and bubble sextant.

Regulation equipment includes a seventy-five-pound anchor and 150 feet of bronze cable for mooring. There is also provided beach landing gear, comprising wheels which may be readily attached for taking the ship up a ramp from the water.

#### SPEED CALCULATION

N aircraft races it is of interest to be able to figure instantly the speed attained. This is possible without difficulty by the use of the following tables and formula.

To obtain Speed (s) in K.P.H. (or M.P.H.): Let D = Distance covered in Kilometers (or Miles); T = Time expressed in Seconds

Then:

$$S = \frac{D \times 3600}{T}$$

The accompanying tables gives the values of D × 3600.



Keystone PK-1 flying boat for long-distance patrol and bombing flights

| D     | D × 3600  | D     | D × 3600  |
|-------|-----------|-------|-----------|
| 100   | 360,000   | 1,100 | 3,960,000 |
| 200   | 720,000   | 1,200 | 4,320,000 |
| 300   | 1,080,000 | 1,300 | 4,680,000 |
| 400   | 1,440,000 | 1,400 | 5,040,000 |
| 500   | 1,800,000 | 1,500 | 5,400,000 |
| 600   | 2,160,000 | 1,600 | 5,760,000 |
| 700   | 2,520,000 | 1,700 | 6,120,000 |
| 800   | 2,880,000 | 1,800 | 6,480,000 |
| 900   | 3,240,000 | 1.900 | 6,840,000 |
| 1,000 | 3,600,000 | 2,000 | 7,200,000 |
|       |           |       |           |

Examples: Distance (D) 1500 Kil. Time

8 hrs. = 28,800 secs. 9 min. = 540 secs. 2 secs. = 2 secs.

 $= \frac{5,400,000}{29,342} = 184.03 \text{ k.p.h.}$ 

Conversion of Minutes to Seconds

| Minutes                                   | Seconds        | Minutes  | Seconds        |
|-------------------------------------------|----------------|----------|----------------|
| 1                                         | 60             | 31       | 1,860          |
| 1<br>2<br>3<br>4<br>5<br>6<br>7<br>8<br>9 | 120            | 32<br>33 | 1,920          |
| 3                                         | 180            | 33       | 1,980          |
| 4                                         | 240            | 34       | 2,040          |
| 5                                         | 300            | 35       | 2,100          |
| 6                                         | 360            | 36       | 2,160<br>2,220 |
| 7                                         | 420            | 37       | 2,220          |
| 8                                         | 480            | 38       | 2,280          |
| 10                                        | 540            | 39       | 2,340          |
| 10                                        | 600            | 40       | 2,400          |
| 11                                        | 660            | 41       | 2,460          |
| 12                                        | 720            | 42       | 2,520          |
| 13                                        | 780            | 43       | 2,580          |
| 14<br>15                                  | 840<br>900     | 44<br>45 | 2,640          |
| 16                                        | 960            | 46       | 2,700          |
| 17                                        | 1,020          | 47       | 2,820          |
| 18                                        | 1,080          | 48       | 2,880          |
| 19                                        | 1,140          | 49       | 2,940          |
| 20                                        | 1,200          | 50       | 3,000          |
| 21                                        | 1,200<br>1,260 | 51       | 3,060          |
| 22                                        | 1,320          | 52       | 3,120          |
| 23                                        | 1,380          | 53       | 3.180          |
| 24                                        | 1,440          | 54       | 3,180<br>3,240 |
| 25                                        | 1,500          | 55       | 3,300          |
| 26                                        | 1,560          | 56       | 3,360          |
| 26<br>27                                  | 1,620          | 57       | 3,420          |
| 28                                        | 1,680          | 58       | 3,480          |
| 29                                        | 1,740          | 59       | 3,540          |
| 30                                        | 1,800          | 60       | 3,600          |

#### Conversion of Hours to Seconds

| Hours       | Seconds | Hours | Seconds |
|-------------|---------|-------|---------|
| 1           | 3,600   | 13    | 46,800  |
| 2           | 7,200   | 14    | 50,400  |
| 2<br>3<br>4 | 10,800  | 15    | 54,000  |
| 4           | 14,400  | 16    | 57,600  |
| 5           | 18,000  | 17    | 61,200  |
| 6           | 21,600  | 18    | 64,800. |
| 7           | 25,200  | 19    | 68,400  |
| 8           | 28,800  | 20    | 72,000  |
| 9           | 32,400  | 21    | 75,600  |
| 10          | 36,000  | 22    | 79,200  |
| 11          | 39,600  | 23    | 82,800  |
| 12          | 43,200  | 24    | 86,400  |

#### DENSITY RATIOS

SOME approximate quations for the standard atmosphere are given in N. A. C. A. Report 376, by Walter S. Diehl. This report contains the derivation of a series of simple approximate of a series of simple approximate of the series of the

ration  $\frac{\rho}{-}$ , in the standard atmosphere.

The accuracy of the various equations is discussed and the limit of applications are given.

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# DIGEST OF FOREIGN TECHNICAL ARTICLES

**ALUMINUM ALLOYS** 

ALUMINUM ALLOYS
The Influence of Titanium Tetrachloride on
the Gas Content and Grain Size of Aluminum
and Some Alloys, W. Rosenhain, J. D. Grogan
and T. H. Schofield. (British) Aeronautical Research Committee-Reports and Memoranda No.
1385, November, 1929. 10 pp., 16 figs.

THE results of experiments to determine the effect of titanium tetrachloride in aluminum alloy castings are discussed. Titanium tetrachloride when passed into molten aluminum appeared to behave in the same way as chlorine and boron trichloride. It reduced the grain size of aluminum castings and did not appear to alter the eutectic structure inside the crystal. The reduction in grain size persisted after remelting even when the molten metal was heated to 780 degrees Centigrade.

It removed gases from, reduced the grain size of, and did not "modify" the twelve per cent silicon alloy. It improved the soundness of cast Y-alloy and decreased the grain size of the cast material. By yielding sound material of fine grain, it enabled cast slabs of Y-alloy 1.5 in, thick to be rolled without the employment of the usual preliminary forging operation. It is concluded that the fine grain produced in Y-alloy by the action of titanium tetrachloride would prove of value both in the production of large sound ingots for rolling into bars and sections and for the production of large

Gas Removal and Grain Refinement of Aluminum Alloys, W. Rosenhain, J. D. Gropan, and T. H. Schofeld. (British) Aeronautical Research Committee—Reports and Memoranda No. 1387 (M. 72). January, 1930, 8 pp., 6 diagrams.

IN the previous report it was shown that titanium tatrachleria.

titanium tetrachloride acted as an effective agent both for gas removal and for grain refinement. In this report it is shown that these properties were independent. Many chlorides possessed the property of removing gas without causing grain refinement, while titanium aluminum alloy, made by the thermit process, caused grain refinement when added to aluminum, but without removing the gas.

Carbon tetrachloride, silicon tetrachloride, tin tetrachloride, aluminum chloride, ferric chloride and tetrachlorethane were effective in the removal of gases from molten silicon aluminum alloy. The efficiency of gas removal appeared to depend on the material employed for that purpose as well as on the quantity. All of the materials, except titanium tetrachloride, caused a very definite coarsening of the eutectic structure. Only titanium tetrachloride and tin tetrachloride produced definite grain refinement, while thorium, of the group containing titanium and tin, did not produce grain refinement when introduced in the form of thoriumaluminum alloy.

ALUMINUM CORROSION TESTS Corrosion Tests in Germany. Aircraft Engineering, Vol. 3, No. 30, August, 1931, pp. 195-196.

PECIFICATIONS laid down by the Deutsche Reichsauschuss fuer Metallschultz for testing the corrosion resistance of aluminum and its alloys are outlined. Noting the changes in surface and micro-

#### Elsa Gardner

structure, the loss of weight, changes in mechanical properties and the nature and condition of the corrosion products are discussed. Directions are given for the laving out of tests, including laboratory tests with specimens immersed in solution or tested alternately in solution and air, and spraying tests, as well as weather and sea-water exposure tests.

CATAPULTS

Catapulting of Airplanes from Ships in a Tossing Sea (Catapultamento di velivoli da nave in mare ondoso). E. Forza. (Rivista Aeronautica, Vol. 7, No. 6, June, 1931, pp. 423-436, 10 figs.)

THE author discusses the conditions necessary for social to the conditions. CATAPULTS essary for safely launching an airplane from a ship in a tossing sea, since the effect of the waves presents a notable instability of the catapult platform. He takes up the cases of a platform statically inclined upward and downward, a horizontal platform moving upward and downward, a platform inclined upward and moving upward and downward, respectively, and one inclined downward and moving upward and downward, respectively. He derives formulas for determining the limits of the oscillations which it is necessary to maintain for safe launching in each case. He reaches the conclusion that it is possible and necessary to launch when the platform, inclined downward and moving upward, attains an approximately horizontal position.

The July issue of Revista Aeronautica (pp. 106-119, 9 figs.) contains a detailed description of a catapult constructed by MacTaggart Scott and Company, Edin-

The July 28 issue of Zeitschrift fuer Flugtechnik und Motorluftschiffahrt (Vol. 22, No. 14, pp. 425-428, 7 figs.) discusses airplane catapults, dealing with the subject generally. Methods for calculating and measuring the acceleration are given and reference is made to the case of catapulting large airplanes.

APPLIED MECHANICS
Proceedings of the Third International Congress for Applied Mechanics, P. A. Norstedt and Soener, Stockholm, Sweden, 1931, Vol. 1, 449 pp., Vol. 2, 468 pp., Vol. 3, 335 pp.

THIS report of the Third International Congress for Applied Mechanics, held in Stockholm, August 24 to 29, 1930, is published in three volumes. The first is devoted entirely to hydro- and aerodynamics, and the second and third contain papers dealing with the theory of elasticity, plasticity and strength of materials, problems of oscillation and stability and rational mechanics and ballistics. The papers are printed in English, French, German, and Italian, according to the language in which they were prepared.

Among the papers of aeronautical interest in the first volume are the following: The Vortex Problem, C. W. Oseen; The Drag Problem, F. Eisner; Airscrew Theory, L. Bairstow; Mechanical Similarity and Vortex, T. V. Karman; The Phenomenous of Rotary Turbulence in Rotating Tubes and Pipes, W. Seelig; The Vortex Theory, W. Tollmien; On the Theory of Gliding, G. Pavlenko; The Body Resistance of a Plate, F. V. Lindner; The Impact of Keeled Surfaces on the Water, H. Wagner: Air Flow Through an Exhaust Valve of Conical Seat. K. Tanaka: Experimental Verification of the Theory of Reynolds and Sommerfeld on the Friction of Fluids, C. Hanocq; Notes on the Mechanism of Bearing Lubrication, G. B. Karelitz: An Apparatus of Two-Dimensional Flow at High Reynolds Numbers with an Application to the Growth of Circulation Around a Wing Started Impulsively from Rest. W. S. Farren; Pictures of Flow for Small and Medium Reynolds Numbers, O. G. Tietjens; Comparison of the Theory of Supported Wings with Experience, E. Carafoli: Theory of the Indefinite Biplane, M. P. Dupont; Measurements in Flight of the Movements of a Stalled Aeroplane, B. M. Jones; A Contribution to the Theory of the Latticed Wing, S. Kawada; The Aerodynamic Drag in Uniformly Varied Flight and the Katzmayr Effect, A. Metral; The Effect of Compressibility on the Characteristics of Airfoils, L. J. Briggs and H. L. Dryden; Airscrews for High-Speed Aeroplanes, H. Glauert; and The Theory of Propellers, E. Hogner. Among the papers in the third volume are: The Effects of Viscous and Solid Friction in Airscrew Drives in Damping Torsional Vibration, B. C. Carter; and Oscillation of the Aircraft-Aerodynamic Suspension, L. Breguet.

AERODYNAMICS
The Validity of Drag Tests on a Large Scale
Model in a Small Closed Wind Tunnel. Drag
of One-fith Scale Nacelle Installed on the Upper
Surface of a Monoplane, F. B. Bradfield, and
W. G. A. Perring. (British Aeronautical Research
W. G. A. Perring. (British Jeronautical Research
A. Perring. (British Jeronautical Research
J. Perring. (British Jeronautical Research
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J. Perring. (British Jeronautical Research
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taken in a seven-foot wind tunnel at the Royal Aircraft Establishment to find whether the drag of a ten-inch diameter nacelle, mounted on a wing of 2.14-foot chord, could be measured correctly in a four-foot wind tunnel. It was desired to check a test made by the firm of Boulton and Paul in a fourfoot wind tunnel on a one-fifth scale nacelle housing a Jupiter XF engine attached to a wing of 2.14-foot chord and 3.5-foot span.

It was found that measured drag results were applicable to the complete airplane when the local lift cofficcient of the wing adjacent to the nacelle was the same in the two cases. It was proved preferable to carry the model wing right across the tunnel, so that the flow was two-dimensional and no doubt as to lift coefficient at the center of the wing was introduced by the tunnel constraint. The same value of nacelle drag against local lift coefficient was obtained with the infinite wing and with the five-foot wing in the seven-foot tunnel, but agreement was less good with the 3.5-foot wing

(Continued on following page)

остовек, 1931



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(Continued from preceding page) in the four-foot tunnel, indicating that the model tunnel size ratio was getting too large to calculate the relevant tunnel corrections. The effect of the Townend ring was large, and the drag of the uncowled nacelle seemed high.

A Study of Slots, Rings and Boundary Layer Control by Blowing. H. C. H. Townsend, Royal Aeronautical Society Journal, Vol. 35, No. 248, August, 1931. pp. 711-743, 16 figs. ERTAIN cases of airflow are discussed

C ERTAIN cases of annow are employed to control the behavior of the air so as to prevent breakdown in the flow and the resulting turbulence. Evidence which exists on such phenomena as slots, rings, and boundary-layer control by means of blowing through backwardly-directed slots in the surface, is analyzed to determine the extent to which their apparent similarity corresponds, if at all, to an identity of physical principle. Published results of experimental work on such devices are discussed and an attempt is made to correlate them.

Results of further experiments are described which have been made to fill in gaps in the data available or to extend them, and include other examples of control of air flow at sharp corners. Some of the cases considered differ widely from others, but all exhibit the reduction in eddying which results from assisting air to negotiate sharp corners of bluff obstacles with the least disturbance possible. There seems to be a fairly clear distinction between the action of the slotted wing and that of a wing with boundary-layer control by blowing through a backwardly directed slot.

AIRPLANE FLUTTER

AIRPLANE FLUTTER
The Flutter of Monolanes, Biplanes, and Tail
Units, R. A. Frazer and W. J. Duncan. (British)
Acronautical Research Committee—Reports and
Memoranda No. 1255, January, 1931, 179 pp.

A Naccount is given of all the more recent
work on flutter carried out at the Na-

tional Physical Laboratory, the subject of propeller flutter being excluded, however. Chapters are devoted to such subjects as wing flutter as influenced by the mobility of the fuselage, conditions for the prevention of flexural-tortional flutter of an elastic wing, the wing flutter of biplanes, the flutter of airplane tails and tail flutter of a particular airplane. All of these have been issued separately, but are now re-issued in collected form with minor improvements and design recommendations regarding the prevention of flutter in wings and tail units. An entirely new introductory chapter provides an elementary account of the theory of wing and tail flutter, the theory being approached by an account of a series of experiments on models.

AIRPLANE NOISE ANALYSIS
Noise, A. H. Davis, Royal Aeronautical Society Journal, Vol. 35, No. 248, August, 1931,
pp. 676-699 and (discussion) pp. 699-710, 9 figs.,
8 tables.

A TTENTION is given to various aspects of the problem of reducing noise in and from airplanes. As a result of a study of the sources of noise-propeller, engine exhaust and engine clatter-it appears that high-speed propellers are the dominant cause of noise. The conditions favorable for the

reduction of propeller noise are reduced speed, larger diameter, and thin section.

The clatter and noise of an engine seem to be of the same order of magnitude as a moderate-speed propeller. Experiments suggest that the propeller noise can be reduced to about eighty decibels and probably something can be done in reducing the engine and exhaust noise by interposing wings as a screen between the exhaust and the cabin, or by enclosing the engine. Some degree of exhaust silencing of about ten decibels can be achieved by a simple perforated pipe. while further silencing may involve increased back pressure. The silencing of engines is considered desirable either by enclosing them, or, if possible, by redesigning camshafts and other parts to modify the motion of moving parts. Laboratory experiments upon the exclusion of noise by the provision of insulating walls, indicate that a reduction on an average of the order of thirty decibels may be attained, provided filled double walls of some three-fourths to one pound weight per square foot are employed.

CAUSES OF CRASH FIRES

CAUSES OF CRASH FIRES
An Investigation of a Possible Cause of Aircraft
Fires on Crash, W. G. Glendinning. (British)
Acronautical Research Committee — Reports and
19 pp., 8 figs. 1375 (E. 47), January, 1930,
THE ignition of gasoline or lubricating
oil by contact with hot exhaust pipes

is investigated as a cause of aircraft fires on crashing. Tests were made to determine the minimum temperatures at which gasoline or oil would ignite inside exhaust pipes and the action of the various factors which affect the minimum ignition temperatures ctudied

It was found that gasoline would explode after a lag of 10 minutes when introduced into a steel vessel filled with air and kept 235 degrees Centigrade. In an exhaust pipe, into which gasoline was introduced while the pipe was cooling, the lowest ignition temperature (measured at the time of introduction) was 280 degrees Cent., the lag period being 10 to 20 seconds. With higher temperatures the lag period was shorter, and at 350 degrees the explosion followed the introduction of gasoline almost instantaneously. The risk from lubricating oil was found to be less, due to its minimum ignition temperature being about 50 degrees higher than that of gasoline,

METALLURGY

On the Yield Point of Mild Steel. F. Nakanishi. Tokio Imperial University—Aeronautical Research Institute—Report No. 72. Vol. 6, No. 6, June, 1931, 140 pp., 8 tables, 44 figs.

THE author proposes a new theory for the yielding of mild steel and considers that the yielding of material is a problem of stability, analogous to the critical point of viscous flow through a pipe. The material yields when the state of stress becomes unstable and all the stress distribution in the body must therefore have effect on the vield point.

During the yielding of a specimen under tension there existed two portions, the yielded and the part not yet yielded. The strain in the yielded portion was constant for the material and very large as compared with that in the other portion. When some part in the body yielded, the strain shifted suddenly from the elastic strain to the yielded strain and the average strain of the specimen increased as such yielded parts increased. When a cylinder yielded under torsion, a thin part between some two crosssections yielded at first, and the yielding spread all over the cross-section. Then such parts came out in succession. Thus, the twisting moment remained constant during the yielding of the whole length, confirming the author's idea. Torsion tests of hollow cylinders showed that the stresses at yield points were not constant. Before the yielded portion was strained further, the adjacent portion not yet yielded began to yield. Hence. the stress was constant where two portions, yielded and not yet yielded, coexisted.

Metallurgical Chemistry in the Aeronautical In-dustry (La chimica metallurgica nell'industria aeronautica), Adelaide Labo. Rivista Aeronautica Vol. 7, No. 7, July, 1931, pp. 30-46, 5 figs., 6

IGHT metals used for the construction of different parts of the airplane are reviewed and their chemical composition and properties are outlined in functions of their heat treatment. The chemical compositions of special steels used by the American Aviation industry are listed in tables and reference is made to types of steel employed in fuselage construction.

Aluminum alloys are considered with emphasis on their increasing importance and the composition of duralumin, superduralumin, cast aluminum, alpax, lautal, avional and antierodal is discussed. The article concludes with references to the advantages of different forms of magnesium alloys and their mechanical properties, as well as the possibilities of berylium alloys.

#### TURBINES

Turbines. Automobile Engineer, Vol. 21, No. 282, July, 1931, pp. 263-264, 4 figs.

SOME notes on the present position of gas and internal-combustion turbine design are given. After a thermodynamic analysis of the gas turbine, the constantpressure and constant-volume types are compared, the constant-pressure type being considered superior in higher blade speed, smaller wheel diameter, simpler construction, lack of ignition devices, favorable power-weight ratio, even torque, high turbine efficiency, and being equally suitable for gaseous and liquid fuels.

Practical solutions of the internal-combustion turbine proved as difficult as the award appeared attractive. High rotational speeds, small space occupied and low weightpower ratio are said to constitute the features that make a high overall efficiency of secondary importance. It is considered that radical changes will have to take place before there will be any solution of the gas turbine problem. Compressor and blower efficiencies and blade material must be improved, while higher rim speeds and higher blade temperatures are essential. The internal-combustion turbine made by Brown Boveri is described and illustrated.

The August 1 issue of Genie Civil (Vol. 99, No. 5, pp. 117-118, 6 figs.) contains a description of the gas turbine designed by остовек, 1931

They put Curliss Conquerors in the DO-X



... and since this letter was written by Capt. Christiansen the DO-X on its trade missionary trip has flown from Brazil, touched at Cuba and along the Eastern Coast of the United States and successfully landed at New York City. • The world-traveling DO-X adds fame to the Dornier staff that designed and built it. Every one of the thousands of miles it has flown adds to the Curtiss-Wright reputation for building Aviation's most reliable power. When the extensive world trip was planned through the

chill of Alpine heights and the heat of Equatorial sun, with true German thoroughness the most reliable power was sought. From the world market, 12 Curtiss-Wright "Conquerors," of 600 h.p. each, were chosen. • Colonel Lindbergh, as a result of his experience with the reliability of Wright Engines, selected a Wright for his flight to Japan. It is this same reliability that has enabled Wright-Powered Planes to win the National Reliability Tour six consecutive years.



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## GEE BEE SUPER-SPORTSTER

Winner of the Thompson Trophy at 236.24 M.P.H.

By Z. D. Granville

ONTRARY to the general belief, the Granville Brothers Gee Bee Super-Sportster is not a radically new ship in general design and construction. Practically every part is either a duplicate or modification of the standard Gee Bee Senior Sportster two-place job now available commercially. The account of details, construction, mechanisetc., following describes both models with the exception of several minor details.

The motor is a Pratt & Whittey Wasp Jr., suped up to 535 horsepower at 2,400 revolutions per minute. The metal propeller is a Curtiss fixed pitch type with a diameter of eight feet two inches and a pitch of nine feet three inches. The fuselage is welded chrome-molybdenum. The wing stub bracing is carried internally. With the exception of this bracing and general size, the fuselage construction is identical with the Senior Sportster, as are also the motor mounting, the N.A.C.A. cowling and other motor attachments.

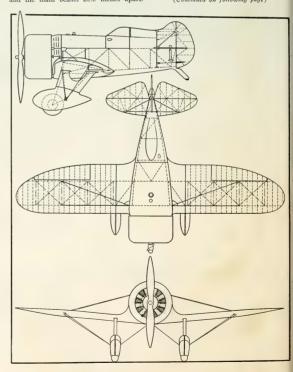
The landing gear is fork type, having a six-inch travel on the oil and spring shock absorber. The shock absorber unit is new but is a development of the original type used on the models E.D. and Y Sportsters. Aircraft Products Company wheels and brakes are actuated by the full-back position of the stick and the directional brake control by rudder pedals. The 23-inch Goodrich tires are 6.50 by 10 and the wheel tread is 71.75 inches. In the accompanying drawing, the wheels are shown in fully extended position. Boots and fairing are attached to the wheel forks in such a way that they travel with the wheel straight up and down, keeping in the line of flight and keeping the wheel and tire covered to a maximum at all positions. The only difference in this construction and mechanism from that of the standard Senior Sportster is the absence of the emergency brake lever which locks the commercial job the same as a parked car. Wheel streamlines are 10.5 inches wide. The tail skid is of the spring leaf type, streamlined with rubber.

The wings are of wood construction, using solid spars and are locked up with nuts. Ribs are spaced 5.4 inches apart and the main beams 25.5 inches apart.

The flying and landing wires by Stewart Hartshorn are single. The wire pulls attached to the compression members relieve the spars of bolt holes and relieve the ribs of all except fabric loads. A hammered aluminum fillet fairs in the angle between the wings and body. The M-6 wing curve is used.

Allerons are torque tube type with formed sheet steel ribs welded to the torque tube. The hinges form bearings for the main torque tube. The extension of the hinges telescopes directly inside the wing compression member at the rear spar. Angular ball and socket controls are used with ball-bearing mountings for all torque tubes. This type of alleron construction eliminates danger of fluttering and minimizes the possibility of pulling off an alleron.

The tail surfaces are welded steel tube construction with wrapped hinges working on the torque tube itself. The rudder, 19 inches wide, is actuated by cables, the 17-inch elevators by a push-pull tube and double cables. The stabilizer, which is 18 inches wide and has a span of eight feet, moves up and down at the rear and is controlled by the screw type jack with (Continued on following page)



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| MODERN FIELD                                                                                      | with hard surfaced runways and fully lighted<br>for night flying. Main passenger lines and air<br>mail service operate from our field.             |  |
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| SOUTHERN AIRWAYS SCHOOLS, Aztec Building, San Antonio, Texas  12 Years Unbroken Record for Safety |                                                                                                                                                    |  |
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|                   | Gentlemen: Tell me about your sp | ecial offer-1 am interested in your |                    |
|-------------------|----------------------------------|-------------------------------------|--------------------|
| Mechanic's Course | ☐ Private Pilot Course           | ☐ Commercial Course                 | ☐ Transport Course |
| AME               |                                  | CITY                                |                    |
| DDRESS            |                                  | STATE                               |                    |

(Continued from preceding page) crank control in the cockpit, giving an irreversible micrometer adjustment. The adjustable stabilizer was found after a test to be unnecesary and when once set has no need to be changed.

The general construction of the wings, ailerons, landing gear, tail surfaces, controls, etc., is identical in all respects other than size with the commercial Senior Sportster. The cockpit cover or windshield is comprised of a large cover having a celluloid dome of sutficient size to give the pilot head room. This cover drops on after the pilot is seated and is held securely in position by quickly releasable door fasteners. In case of emergency this entire cowling over the cockpit can be released by one pull of the lever, allowing the pilot absolute freedom in leaving the ship.

The Fiberloid portion of this cover is so designed as to give vision in every direction other than straight back, and also so that the line of vision is approximately at right angles to the Fiberloid. This arrangement allows the pilot full protection from wind, effecting the consequent minimum of resistance, yet affords undistorted and unobstructed vision ahead, up, down, and on all sides. Cockpit ventilation is accomplished through tubing which brings in fresh air from wing stubs, and is controlled by a ventilator in the instrument board.

Contrary to the usual design, the fuselage is faired out to form a gentle outside curve from the 46-inch-diameter N.A.C.A. cowling back, gradually flattening to the vertical tail surfaces at the rear. This plump fuselage gives it the appearance of being abnormally short coupled. The company has received criticism of this so-called short coupling, but its engineers state that their past experience with the various Sportster models has proved to their satisfaction that this design is as rigid, maneuverable, and as stable as the longer types of fuselages.

#### Specifications

| Top speed270 miles per hour                      |
|--------------------------------------------------|
| Cruising speed230 miles per hour                 |
| Landing speed80 miles per hour                   |
| Fuel capacity                                    |
| Oil capacity                                     |
| Cruising range                                   |
| Wing area, including ailerons.75 square feet     |
| Wing span                                        |
| Chord at root                                    |
| Length overall                                   |
| Load factor, high angle of attack10              |
| Incidence angle3 degrees                         |
| Dihedral angle4.5 degrees                        |
| Aileron area9.5 square feet                      |
| Stabilizer area8.4 square feet                   |
| Elevator area6.9 square feet                     |
| Fin area2.2 square feet                          |
| Rudder area4.9 square feet                       |
| Power, supercharged Wasp Jr.535 hp at 2400       |
| Weight empty1,400 pounds                         |
| Gross weight (full load)2,280 pounds             |
| Wing loading (full load) . 30.2 lbs. per sq. ft. |
| Power loading (full load) 4.26 lbs. per hp.      |
|                                                  |

# Single Unit Control

#### By Commander Mario de Bernardi

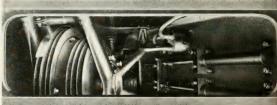
NE of the most important problems that has confronted aeronautical engineers during-recent times is that of simplifying the controls of an airplane to attain a greater ease in piloting.

In the conventional airplane the pilot must manipulate the throttle, the control stick and the rudder bar to keep his plane under control in three dimensions. When executing difficult maneuvers in military flying, he must possess the utmost of skill to coördinate the use of the various controls at his disposal. The constant attention to the controls required of a commercial pilot flying large transport ships is fatiguing on long flights and especially at night or in foggy weather when he must keep close watch on a number of flight instruments while attending to the controls.

I have devoted a great deal of study to the problem of simplifying the handling of an airplane and concluded that the best procedure is to eliminate the rudder bar, which, because of its position, causes difficulty and fatigue to the pilot. Generally, the pilot has an imperfect sensation of the rudder bar which he operates with his feet. In fact, his legs may remain for a long time in an uncomfortable position. Sometimes they will not respond to his will in spite of the fact that they appear parallel and equally stretched. Errors of pilot are often a result of this leg fatigue, coupled with the fact that it is difficult to follow a correct course and that an inversion of the control of direction with that of the ailerons may cause a wing slip. This may place the pilot in the position of not being able to correct the mistake, particularly at a low altitude. With the single unit control the pilot does not have to rely entirely upon his senses to correlate correctly the movements of the various controls.

The invention consists of a mechanism which groups in a single system all the elements of airplane control, coördinating in an established relation the movements of the ailerons and rudder. The apparatus comprises an ordinary airplane steering wheel so connected that the rotation around its own axis is sufficient to transmit simultaneously in the pre-established relation all the movements of the ailerons and rudder. The operation of the elevator is accomplished

(Continued on following page)





Pilot's cabin of Caproni Ca. 97 equipped with the de Bernardi single unit control

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in the ordinary manner by a fore and aft movement of the control column.

It follows that the angles of rotation of the ailerons and the corresponding angles of rotation of the rudder are always in constant ratio to each other. Thus, turns are made in the best angle of inclination possible, that is, the airplane turns in such a way that the result of weight and centrifugal force during the turn is exactly equal and contrary to the aerodynamic reaction of the wind on the airplane. Lateral forces or forces on wings which may produce unstable positions resulting in side slips and stalling are avoided.

Through a disengagement of the transmission of the ailerons with relation to the rudder, straightaway flight and turns may be controlled independently of each other. It is possible to obtain a variation of the relative position of the two organs in the unit control. Special indicators measure the value of the two rotations of the guiding control and thus show to the pilot the magnitude of the movement of the movable surfaces.

This is obtained by the use of two sprockets mounted on the axle of the wheel. The first one is fixed and controls the pulleys of the aileron cables, while the other is free and controls the pulleys of the rudder cables. A movable handle rigidly connected with these last pulleys is either fixable or movable according to the desire of the pilot. Thus, a correct correlation between the movements of the rudder and ailerons is realized.

When the airplane is placed in an abnormal flying position, the pilot can readily bring the ship back into a normal attitude. He has only to look at the dial plate and bring the indicators on the line indicated for the particular maneuver he is to carry out. If this apparatus is installed on a multi-engined airplane and one of the lateral engines stops, the pilot has only to disengage the control of the rudder, set the displacement necessary to bring about the correction required and then re-engage the machinery which sets the rudder and alleron at the proper place.

Sometimes side winds cause errors in direction without the pilot being able to determine their exact effect. With the single unit control, such errors can be compensated for, both while flying or while on the ground. Consequently, the pilot does not have to determine variations of the angles of direction, especially on the compass.

This apparatus has been installed on a Caproni Ca. 97 and a number of tests have been carried out with successful results. This ship is a cabin monoplane which may be equipped with one, two or three engines. In these tests, a single Jupiter R. engine of 420 horsepower was used. Wing span is 52 feet 6 inches;

length overall, 36 feet 7 inches; height overall, 11 feet 6 inches; wing area, 429 square feet; weight loaded, 5,390 pounds; weight empty, 3,190 pounds; and useful load, 1,320 pounds. High speed is approximately 140 miles per hour. In a number of test flights with technicians and pilots aboard to observe the results, the plane, equipped with this apparatus, demonstrated that it possessed all the characteristics for which it was designed.

In blind flying without a number of flight instruments the pilot is often consused as to the position of the plane and cannot depend on his senses. With the single unit control, however, the pilot obtains data necessary for the route he is to follow and establishes the position which the movable surfaces must have in relation to the actual conditions of flight and to the characteristics of the airplane. He then arranges his control

in the required position and that part of the mechanism which controls the correct position will automatically perform its task.

Because of the automatic return to normal flying positions as previously arranged and the possibility of reading on the dial plate the maneuvers which are executed, the pilot may keep his plane in a stable condition, regardless of the lack of visibility. In military flying, especially on long-distance reconnaissance or bombing flights, the plane may be set to hover over an objective and most attention given to observing the ground rather than controlling the plane.

On bombing planes, through a special transmission system, the displacements of the leveling telescope and the single control can be coördinated to bring the plane on the required objective.



### CAPRONI Ca. 113 BIPLANE

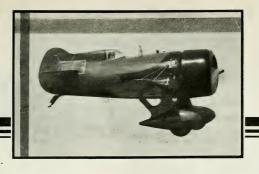
A MONG the planes of foreign manufacture flown daily at the National Air Races at Cleveland in September was a Caproni Ca. 113 biplane. This ship was piloted by Commander Mario de Bernardi of Italy, a member of the international aerobatic team which, headed by Alford Williams of the United States, occupied an important place on the race program.

This model of the Caproni make of aircraft is a two-place, open-cockpit, dual-control biplane. Wood and steel tubing is used in the construction of the framework.

The powerplant is a radial, air-cooled, 240-horsepower Walter engine equipped with a Walter carburetor especially designed for acrobatic flying. The engine is attached to a frame of steel tubing by means of five bolts. Fuel and oil tanks are installed in the fuselage forward of the front cockpit. The intake of fuel and oil is effected by means of an immersion tube designed to feed the engine while the plane is in any attitude. A "Televel" mechanism which functions in any position of flight indicates the level of fuel contained in the tank. The starter employs a compressed air system, using a gasoline injector of the "Maliverti" type.

Two pilot cockpits are provided in tandem, accessible from the left side of the fuselage. Both cockpits are equipped with controls and with flight instruments. The seats are designed to accommodate "Salvator" parachutes which serve as back cushions.

The wings have a conventional construction and are staggered. The interplane "N" struts are of streamlined steel tubing. There are four ailerons. The fuselage is of the quadrangular section type, covered on top with duralumin and on the sides and bottom with fabric. The tail has a framework of steel tubing covered with fabric. The fixed horizontal plane has a variable incidence which can be regulated during flight. The vertical rudder is of three-ply wood. The landing gear is of the split-axle type, equipped with a steel spiral spring and pneumatic oil shock absorbers. The tail skid is attached to the extreme stay of the fuselage and its oscillations are controlled by a steel spiral spring. The wheels are provided with axle brakes and a streamlined covering faired into the landing



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- b. Rear view
- c. Side view d. ¾ Front view e. ¾ Rear view

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- Thompson Trophy winner. Wasp Jr., super-charged to 580 h.p. Speed 280 m.p.h. Gee Bee Sportser, Model YL
- Powered by Lycoming. 235 h.p. Speed 168 m.p.h. Gee Bee Sportster, Model YW Powered by Wasp or Wasp Jr. Speed 200
- D. Gee Bee Sportster, Model D. Powered by Menasco "Pirate", 90 h.p. Draw-
- ing No. 1 only.
- ing No. 1 only. Gee Bee Biplane, Model E Powered by Kinner. Drawing No. 1 only Gee Bee Sportster, Model E Powered by Warner "Scarab," 110 h.p. Drawing No. 1 only.

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# THE LAIRD Super-Solution SPEEDWING

Coast-to-coast speed record holder flown by Major James Doolittle

Bv

#### E. M. (Mattie) LAIRD

AST year we produced the Laird Speedwing "Solution," which won the Thompson Trophy Race at the National Air Races. This machine averaged 201.96 miles per hour for the 100mile stretch (twenty laps over a fivemile course).

This year work was started on the "Super-Solution" July 8th and the ma-chine was test flown August 22nd. It was designed and built for the Cleveland Speed Foundation to be flown by Major James H. Doolittle.

In general the design of the machine has remained the same as the original "Solution." The changes mainly consist of refinements and added power. The finished plane, designated as Model LC-DW 500, was test flown by me at Ashborn Field, near the factory. There were surprisingly few changes and adjustments required before the ship was turned over to Major Doolittle prior to the coast-tocoast speed record attempt. The model designation, which has seemed mysterious to some, simply means the following: LC-Laird Commercial; D refers to the series; W indicates the powerplant as a Wasp; and the 500 refers to the horsepower.



Official U. S. Army Air Corps photo

The ship this year was fitted with complete instruments for cross-country and blind flying, which was one of the reasons why its weight exceeded the weight of the "Solution" by 200 pounds. Among these new features were the special air vents, which took air into the leading edge of the top wing well outside of the range of engine exhaust and conducted it through vents into the cockpit.

The streamlining of the fuselage was carried out more thoroughly in the "Super-Solution." The upper part continued back over the pilot's head, allowing him an opening on either side for observation. The whole structure could be quickly opened for emergency exit from the inside, the two sections of cowling hinging about half way down the side of the fuselage.

The landing gear was changd considerably, eliminating the rigid cross member and substituting a tension member, which crossed the gear at the top of the wheels. A flying wire was run from the upper end of the wing struts down to the intersecting points of this cross wire on the gear. The shock absorption system in the "Super-Solution" consisted of two Cleveland Pneumatic struts for each

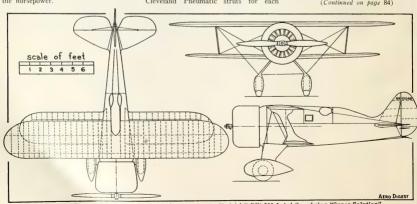
wheel, permitting a maximum travel of four inches. The addition of streamlined housings for the wheels doubtlessly was responsible for considerable increase in performance.

During both the transcontinental flight and the Cleveland races, the direct-drive engine was used. It was announced during the races that the powerplant would be changed to a geared drive, but it was not possible to make these changes in time for the event.

The "Super-Solution's" performance showed an increase in top speed of twenty-one to twenty-five miles per hour over the original "Solution," but this was later increased to thirty-one miles by the substitution of a geared engine.

With the direct-drive engine the propeller diameter was eight feet three inches with a 24° setting at the 42-inch station. The revolutions per minute under these conditions was 2,400. With the geared engine the propeller diameter was increased to nine feet and the pitch setting was 32° at the 42-inch station. This reduced the propeller revolutions per minute to 1,600.

(Continued on page 84)

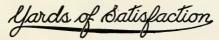


Scale outline drawings of Doolittle's racing plane, the Model LC-DW 500 Laird Speedwing "Super-Solution

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# GERMAN TRANSPORT AIRPLANES

(Part IV)

#### Edwin P. A. Heinze

When the designs of the principal manufacturers in Germany producing passenger and freight planes for land use. There yet remain some landplanes to be considered, namely, the highly successful models of the Dornier and Rohrbach companies. These makers, however, are more important as producers of flying boats and since their landplanes in many respects show a certain similarity in constructional features to their flying boats, it will doubtless be propitious to deal with them when describing the latter.

Before turning our attention to the German flying boats, there are some other transport planes produced by less well-known makers, to be referred to. There is the Albatros Aircraft Company of Berlin-Johannisthal, which is making a new bid for a lost market by the introduction of a new freight carrier. There is also the Arado Company of Warnemünde, with a well-tried and efficient mail plane. And there are the catapult planes and the new amphibion of the Ernst Heinkel Company of Warnemünde.

#### The Albatros "Eagle"

The Albatros L 83 "Eagle" (Adler) has been designed for transport of goods over relatively long distances and is one of the most economical German machines. It is a monoplane with low-set wings in three sections, the central one, similar to the Junkers, being integral with the fuselage structure below the cockpit and fore part of the goods hold. The wing stubs, however, have struts leading to the top of the fuselage.

The wings are trapezoid in plan contour and their spars and ribs consist of



One of the Arado monoplanes operated by the Luft Hansa

duralumin, the spars being constructed of extruded profile lengths formed into a bridge truss type girder by short duralumin tube stays, the whole being riveted. The ribs are constructed in the same manner. The wing skeleton, like the fuselage, is covered with fabric, and the wing end sections are secured by means of cap nuts at four points to the fuselage stubs. The breaking load of the wing structure is 5.14 times the plane's gross weight. The wings have a slightly cambered lower surface and a span of 82 feet with a lifting area of 624.3 square feet.

The Albatros company has always taken special care-to insure good visibilative from the cockpits of its planes. Before completing the design of a plane the company builds up a full scale model of the fore part of the machine with wings and cockpit in order to ascertain the best position for the seats of the pilots and to determine what alterations are necessary to secure best possible visibility.

The fuselage consists of a framework of welded tubes, which in the rear is braced with wire. The nose part is detachable and a wholly enclosed cabin is provided for the pilots behind the firewall over the stub wing structure. The cabin is accessible through a door in the rear wall leading to the cargo hold and through a hatch in the ceiling. The cargo hold has a length of 7.7 feet, a breadth of 4.2 feet and height of 4.9 feet, giving a cubic foot content of 159 cubic feet. The floor of the hold, as are also the front and rear walls, is covered with corrugated duralumin; the side walls are of fabric, provided with three fixed windows of cellon, and protected by wire netting. A door is located in the left side and the ceiling has a hatch 2.3 feet by 1.6 feet in size. The length of the plane is 43.4 feet and its height 11.2 feet.

The control surfaces all have metal frames and fabric covering. The rudder in is arranged standing on top of the wedge ended tail, to which is secured the compensated rudder. The stabilizer, which can be adjusted during flight, lies on top of the rudder and is braced by one strut on each side leading down to the lower fuselage longeron. The machine is equipped with dual controls of the normal type, steering transmission consisting of a joint system of rods and cables in which all bearing points are provided with ball bearings. Ready accessibility to all important parts is se-

The landing wheels are independently sprung and the spring support has compression rubber shock absorbers combined with hydraulic dampers. On request hydraulically operated wheel brakes are also supplied. The Albatros still retains the tail skid, which is steerable.

A Junkers L 5 with a compression ratio of 5.5 to 1 developing 280 to 310 horsepower is employed. It is supported in a welded steel tube structure secured by four ball and socket joints to the fuselage. The motor cowling is horizontally divided and consists of two main parts hinged at their rear ends so they can be turned up and let down respectively, leaving the entire motor accessible. The radiator, which is retractable, is arranged in the bottom of the fuselage between the motor and the fire wall. It can be let down or drawn up by means of a crank within reach of the pilots. Normally this Albatros is fitted with two fuel storage tanks located in the wing stubs and holding 53 gallons each. The service tank is below the ceiling of the cockpit and holds 5.3 gallons. A Junkers fuel pump driven by the motor feeds the service tank and for emergencies a hand pump is additionally provided. The oil tank holds 41/2 gallons and is located behind the fire wall. Further fuel tanks can be fitted in the wings if desired.

The weight empty of the machine fully equipped is 3,440 pounds, and it is able to carry a useful load of 2,640 pounds, of which 1,685 pounds are pay load. The full flying weight being 6,080 pounds, the



Albatros L 83 "Eagle" for long-distance freight transport



Heinkel amphibion powered with a P. & W. 425-horsepower Wasp

wing load is 9.75 pounds per square foot, which is relatively low for German transport planes, and the power load is 16.6 pounds per horsepower. High speed is stated to be 118 miles per hour, the cruising speed 103 miles per hour and the landing speed 52 miles per hour with the indicated quantity of fuel the Albatros will stay in the air 4½ hours mult travel approximately 465 miles. The inel consumption amounts to 125½ younds per hour and the service ceiling of the plane is 15,000 feet.

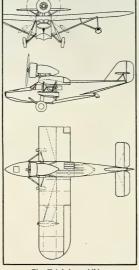
#### The Arado

The Arado company of Warneminde at present only produces one type of plane in three executions of the same size. It is a shoulder monoplane of 595 foot-span, a lifting area of 508.5 square feet and a total length of 30.3 feet. For passenger transport it is supplied in two executions, one with a Pratt & Whitney Hornet motor of 500 horsepower output, the other with a Junkers L 5 delivering 310 horsepower. The third plane has the Hornet motor also and is solely meant for cargo or mail transport.

The Arado sprang into fame in the service of the Luft Hansa, in which it did pioneer work in opening up new long-distance mail routes from Berlin to Teneriffe on the Canary Islands (in ten hours) and from Berlin to Constantinople (also in ten hours).

The wing of the machine is made in two parts linked each to the top longeron on the fuselage, which consists of welded steel tubes held in position by a V-strut on each side leading down to a welded knot-joint of a triangular strut system rooted in the top and bottom longerons of the fuselage. These serve also as wheel support. The swing sections are entirely made of wood with plywood covering down to the second spar and fabric covering from there to the trailing edge. The leading and trailing edges are parallel and the wings have the same section throughout with a flat lower surface and a chord of 9.18 feet. The tips are rounded enclosing the ailerons, which, like the other control surfaces, have a metal frame.

The front end of the fuselage is formed to support whatever motor is used, and, therefore, does not admit of fitting other types of motors as would be the case with a separately attached motor sup-



The Heinkel amphibion

port that could easily be exchanged. The cockpit is very close up to the motor and the two pilots are seated high up with their heads in a glass superstructure giving excellent visibility in front and down the sides. Access to the cockpit is gained through a door in the partition to the passenger cabin or goods hold, and emergency exits are provided both in the ceiling and the bottom of the fuselage. The seats can be adjusted for height during flight. The roof of the cabin behind the cockpit can be removed. The floor of the fuselage, which has rectangular section, is drawn low down, securing ample head room in the cabin, which has a length of 7.2 feet, a breadth of 4.4 feet and a height of 6.2 feet and contains four basket chairs facing forward. Behind the cabin the fuselage contains a luggage room 3.1 feet in length, 4.2 feet in width and 5.5 feet high. Half of this may be equipped as a lavatory. In the cargo machine the partition between the cabin and this room drops away, leaving a goods hold 10.3 feet in length.

The fuel tanks are located between the wing spars of both wings; the oil tank is situated in the nose part of the right wing.

The passenger machine with the Hornet motor is capable of 124 miles per hour and weighs empty 3,320 pounds. It is able to convey a useful load of 2,200 pounds, of which normally 1,065 pounds are payload. The total flying weight is 5,520 pounds, making a wing load of 10.85 pounds per square foot and a power load of 11 pounds per horsepower. The Junkers-powered machine weighs empty 3,080 pounds, carries 2,090 pounds (1,065 payload), and weighs when fully loaded 5,170 pounds. The wing load is 10.18 pounds square foot; the power load 17 pounds horsepower. The maximum speed is given as 109 miles per hour. The cargo machine, which, as mentioned, also has a Hornet motor, weighs only 3,320 pounds. The useful load is 3,150 pounds, the payload 2,015 pounds and the full flying weight is as high as 6,470 pounds, so the wing load comes to 12.7 pounds per square foot and the power load is 13 pounds per horsepower. The maximum speed is 124 miles per hour.

#### Heinkel Planes

The Ernst Heinkel Aircraft Company of Warnemünde, founded in 1922, has so far not been conspicuous as a maker of



Catapult launching Heinkel ship-to-shore seaplane from S. S. Bremen

passenger and goods transport planes. Yet it is one of the most successful factories in Germany, for it does a considerable export trade in military, naval, schooling and other types of planes for special purposes (expedition, newspaper transport, photography, etc.) It has made two hits in the transport plane field by the design of the well-known catapult planes employed on the German liners Bremen and Europa for the transport of mail to and from the ships and in the recently introduced amphibion plane, the merits of which, however, have yet to be established in regular service. As both types of machines come within the scope of our article we will give a description-a brief one in view of the fact that these machines have been described at some length in AERO DIGEST.

Of the catapult planes only two have so far been built and these differ from one another in small details. For instance, the last one has the two seats for the pilot and the mechanic or wireless operator arranged side by side. We will deal with the latter, which is stationed on the Europa. This plane has the factory designation H.E. 58 and is a cantilever type of monoplane with lowset wings having a slight dihedral angle and floats. The span of the wings is 56.4 feet, the lifting area measures 531.7 square feet and the over-all length of the machine is 38.7 feet, while the height amounts to 15.4 feet.

The fuselage consists of a framework of steel tubes with four longerons and welded-in rectangular frames and bracing tubes. It has a skin of light metal from the nose to just behind the mail compartment, from whence to the tail tip it is covered with fabric. The steel tube motor support is secured to the foremost bulkhead, which acts as fire-wall, behind which are arranged the fuel and lubrication fittings, the steering controls and two seats.

The two wings are secured by bolts to the fuselage and are made of wood with fabric covering. The wings have two box spars with spruce flanges and plywood webs. Also several of the ribs are of the box type to secure utmost rigidness against torsional strains. Inside the wings are braced with steel tubes and plywood sheets in the parts where the fuel tanks are located. Also the leading edge is formed with plywood. The control surfaces have steel tube skeletons and cloth skin.

The floats are attached in the usual manner and are built of wood, the interior being subdivided by bulkheads into several watertight compartments.

A Pratt & Whitney Hornet motor is employed giving the machine a maximum speed of 124 miles per hour and a normal cruising speed of 100 miles per hour. The plane weighs empty but fully equipped 3,960 pounds and is capable of taking a useful load of 2,730 pounds, of which approximately 490 pounds can be

considered payload as the plane has to carry fuel for flights of at least 600 miles distance. The full flying weight being 6,690 pounds, the wing load amounts to 13 pounds square foot and the power load to 138 pounds per horsepower.

The Heinkel-Amphibion is a metal flying boat with shoulder wings braced with long V-struts linked two-thirds the distance from the hull to the wings and to the lower edge of the hull. Also lateral supporting floats are provided under the wings. These have wooden box-spars in combination with metal ribs and diagonal bracing tubes of light metal and steel. The fabric skin is laced on with wire. The wings have a dihedral angle of 3.5 degrees. Their leading and trailing edges are parallel and the tips are rounded. The chord measures 110 inches, the span 52.5 feet and the wing area 422 square feet, while the length of the ship is 38.8 feet and height on wheels 14.7 feet,

The hull is divided into three compartments by bulkheads, the front one being used for stowage and luggage, the middle as cabin and the tail section remaining unused. The cabin contains three rows of two seats with a gangway

between them down the center.

The landing wheels struts are each supported at three points on the hull. The compression strut is telescopic and the wheels are let down or retracted hydraulically, a pump and oil container being arranged within reach of the pilots. To relieve the hydraulic system of landing shocks a mechanical lock snaps in position when the wheels are out.

The bottom of the hull has a flat and curved V-form, which is more pronunced behind the step. At the rear it tapers to a wedge carrying a water rudder, which is so constructed as also to act as tail skid on land.

A Pratt & Whitney Wasp motor of 425 horsepower output is fitted on a nacelle standing on stays above the hull and access to the cabin is obtained through a hatch and steps behind the nacelle.

Maximum speed is 115 miles per hour and landing speed is 58 miles per hour. It weighs fully equipped but otherwise empty 4,000 pounds, takes a load of 1,720 pounds and fully loaded weighs 5,720 pounds, giving a wing load of 13.5 pounds per square foot and a power load of 13.4 pounds per hoursepower.

#### THE MENENDEZ DRIFT INDICATOR

A N INSTRUMENT that solves in a graphic manner the "speed triangle" for air navigation has been invented by a young pilot, Antonio Menendez, of Cienfuegos, Cuba. On a recent flight from Chicago to Havana and Cienfuegos, Mr. Menndez had the opportunity of testing the practicability of his invention, and he reports the result as highly successful.

The device consists of a disc on which is marked degrees and the points of the compass; another smaller member shaped like a sector, also marked with degrees; and three rules divided into equal sections representing measure units for speed, which may mean miles or kilometers or any other unit of measurement desired.

Two of the rules revolve around a screw through the center of the dise: the rule indicating the true direction of the plane (which in the accompanying illustration is 90 degrees) and a smaller rule on the dise that points the direction of the wind and gives also the speed of the wind, which in this case is 315 degrees

and 25 miles per hour. The third rule is pinned to the graduated sector and moves with this along the first rule. When the point on the third rule (indicating the relative speed of the plane) is brought to coincide with that on the second rule (indicating the speed of the wind) we obtain the absolute speed of the plane in the air on the first rule, and the angle of drift on the sector.

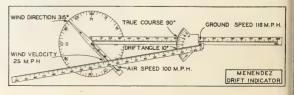
The instrument is used in the following manner: Assume that the true direction is 90 degrees, the wind direction, 315 degrees, and the wind velocity, 25 miles per hour. Setting the instrument with these factors in the respective places, we get the absolute speed (ground speed) on the first rule, 116 miles per hour, and on the sector, a negative angle of drift of ten degrees.

Thus we arrive at the following

Absolute speed of the plane, 116 miles per hour.

Angle of drift, 10 degrees.

Compass direction: (90 minus 10 degrees), 80 degrees.



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# DIGEST OF A.S.M.E. AND S.A.E. PAPERS

AUTOGIRO PROGRESS Progress of the Autogiro Development, A. E. arsen. S. A. E Preprint. 6 pp.

THE Chief Engineer of the Autogiro Company of America briefly traces the

progress of the Autogiro, contrasting the experimental venture as shown at the National Air Races a year ago with the serious manufacturing proposition of today in which the sale of three new approved models takes place daily and many new types are awaited. The Department of Commerce investigation of Autogiro engineering and the subsequent approval of three design types are related and the progress made by the Pitcairn Aircraft. Kellett Aircraft Company and the Buhl Aircraft Company in Autogiro development is outlined. Various parts of the Autogiro which required modification are discussed and a study made of the aerodynamic relationships existing in the three or four widely different combinations of rotor and fixed wing, which are briefly described. Nine cases of the use of the Autogiro by commercial and government organizations are listed.

LOAD FACTORS

The Rationalization of Load Factors for Airplanes in Flight, J. S. Newell. S. A. E. Preprint. 21 pp., 8 figs., 3 tables.

A METHOD is proposed for determining load factors in the high angle of attack condition by the use of two rational variables and one empirical coefficient. The method is applied to some nineteen airplanes and the results compared with the factors established by current practice. An effort is also made to coordinate wing and tail loading conditions by establishing limiting velocities for various maneuvers. The velocities depend on the magnitudes of the factors where such factors have been established by past experience, and the factors are dependent upon velocities where new conditions require diving and pulling out from dives at speeds in excess of those formerly considered necessary. Two categories are established, one for pursuit ships, diving bombers and similar craft which must be brought out of dives at terminal speed, and the other for commercial or non-acrobatic military types for which it is possible to establish limiting maximum diving speeds.

# PROPELLER DESIGN

Aeronautic Propeller Design, F. W. Caldwell. S. A. E. Preprint. 5 pp. and 7 figs. on sup-plementary sheets.

SOME of the problems involved in the design of airplane propellers are briefly summarized and development work now being carried on is outlined. The effect of high speeds on propeller efficiency, propeller stresses, and the safe life of propellers are discussed. A vibrating machine recently designed by the author's company for making accelerated tests in order to check the effect of vibration occurring in the plane of torque is illustrated. This type of test is thought closely to approach the actual conditions of forced vibration present when the

# By ELSA GARDNER

A symposium of some of the papers presented during the meetings of the Society of Automotive Engineers and the American Society of Mechanical Engi-neers in conjunction with the National Air Races at Cleveland, Ohio, September 1-4.

propeller is run on the engine. Aluminumand magnesium-alloy and hollow-steel propellers and the advantages of controllablepitch propellers are referred to.

MAGNESIUM ALLOYS
Magnesium Alloys in Aircraft-Engine Construction, G. D. Welty. S. A. E. Preprint. pp., 11 figs. on supplementary sheets.

T HE substitution of magnesium base alloys for those of aluminum is discussed, and the physical properties of magnesium and aluminum castings and forgings are compared. Features of design which should receive special attention when changing from an aluminum casting or forging to the same part in magnesium are emphasized. The most promising immediate field for the magnesium alloys is said to lie in those applications where strength and lightness are the main considerations and where high temperature properties are of secondary importance.

Machining practice for magnesium alloys is covered in some detail as well as the question of protection against corrosion. It is stated that the present casting alloys have proved commercially satisfactory, from the corrosion standpoint, for all types of land service and for most salt water service, in the middle and upper latitudes. In tropical salt water, however, a certain amount of trouble has been encountered and some protective measures appeared necessary. A few recent developments in fabricating the magnesium alloys are included.

INSTRUMENT-BOARD VIBRATION A Study of Airplane and Instrument-Board Vibration, S. J. Zand, S. A. E. Preprint. 18 pp., 30 figs., 3 tables.

THE purpose of the investigation described was to give to vibration such dimensions in terms of frequency, amplitude and form, that vibration might be defined and compared without reference to bodily sensations in order that standards and limits might be established for specifying the performance of aircraft instruments. The serious mathematical analysis was carried out in the investigation of resonance conditions between engine and engine mount. An apparatus of the same size as that of any standard aircraft instrument, a photographic recorder, was developed which operates on the principle of the seismograph. A complete mathematical analysis, description, and method of calibrating it are given.

Vibration test-stands used for duplicating airplane vibration in the laboratory are described. The analysis of records obtained on them seemed to indicate that duplication of vibration in the laboratory was not fully accomplished. A few of the records anu results of flight tests are given. A table is presented which gives the arbitrary relation of bodily sensation to amplitude.

From the data and records it was concluded that the failure of instruments on some airplanes could be traced to abnormal vibration of the instrument board or the structure near it. The frequency of vibration at the instrument board was equal to the engine speed. The vibration of instrument boards in the large majority of cases was unidirectional and parallel to the X or fore-and-aft axis of the airplane. The timeamplitude curve resembled a simple sine curve. Vibrations of instrument boards were inherent in the type of complete plane giving a similar amplitude-frequency relation for different airplanes of the same type. The engine and propeller alone were not ordinarily responsible for excessive vibra-

#### FIRE PREVENTION

Fire Prevention and Protection in Air Trans-ortation, W. Littlewood. A. S. M. E. Preportation, W

MEANS for preventing and combating airplane fires in the air and the fire protection of a well-equipped airport are discussed. Airplane and engine manufacturers are urged to give thought to the development of the following: Design, mounting and location of gasoline and oil tanks, pipes, and fittings to prevent leakage; ventilation and drainage of all compartments housing these tanks: outside location of exhaust pipes and highly heated engine parts: elimination of the use of combustible structural, finishing, or sound- or heatinsulating materials, or porous materials where they might absorb oil; and sheetmetal protection of fabric-covered planes back of the firewall and parts exposed to the exhaust gas. It is considered that all air transport planes should be fitted with manually operated extinguishers protecting all engine compartments used in conjunction with visual fire alarms, as well as gasoline and engine shut-offs, and tetrachloride extinguishers located in each compartment.

After dealing with the equipment required for fire protection of an airport, the author lists sixteen fire regulations designed for the air transportation industry, covering among these the protection of airplanes in case any part must be welded. He concludes with suggestions for portable fireprotection equipment for risks not otherwise specifically protected.

LIQUID COOLING FOR ENGINES Sealed Liquid Cooling, J. H. Geisse. S. A. E. Preprint. 7 pp., 5 figs. on supplementary sheets.

THE investigation conducted by the Navy in adapting airplane engines to the use of ethylene glycol as a coolant in place of water, is outlined by the Vice President of Engineering of the Comet Engine Company. The Comet Prestone engine, designed from the ground up to accommodate the new system of cooling and delivered to

(Continued on following page)

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(Continued from preceding page)

the Navy, is described and illustrated. The construction is similar to that of the Wright E-4 previously used by the Navy in these tests, in that it is of the dry sleeve type with no joints to cause trouble through leakage. It differs from the E-4 and all watercooled engines in that the liquid does not completely surround each cylinder, providing direct air cooling for the thrust and anti-thrust sides of the cylinders. In operation, the jacket space is filled with the coolant and then sealed from the atmosphere except for provision of a pressure relief valve close to the top.

Results obtained in acceptance tests are discussed and particular attention is called to the very small variation in the liquid temperatures measured between the heads of the cylinders. The author's method of pointing out the advantages of the new cooling principle over both direct air cooling and liquid cooling consists chiefly in reviewing the disadvantages of the radial aircooled engine. He concludes with a reference to the possibilities of the new cooling system as applied to large Diesel engines.

AIR TRANSPORT OPERATION
Ludington Line Operations, P. F. Collins.
A. S. M. E. Preprint. 5 pp.

E CONOMIES adopted by the Ludington poration in order to reduce its operating costs are taken up by the Vice President in Charge of Operations. The value of centering the responsibility of inspection in various expert men and grouping various parts of the ship and motor under their supervision is shown. Reducing the most important item of maintenance expense. namely replacement of worn parts, is discussed and cases in which the cost of replacing a whole assembly to remedy worn bearings and bushings was reduced by redesigning the parts related. The heating and ventilating system employed on the Ludington airplanes is described.

SUPERCHARGERS The Turbo Supercharger, A. L. Berger and O. Chenoweth. S. A. E. Preprint. 16 pp., 31 figs.

THE history of turbo-supercharger de-velopment is outlined, showing the progress of the supercharger and the related airplane parts. The developments in the fuel and cooling system, exhaust manifolds and nozzle boxes, turbine buckets, propellers, ignition systems, carburetors, intercoolers, and bearings and lubrication, which have taken place recently in connection with the supercharger are discussed. A study is made of the power required by the compressor and power delivered by the turbine on the basis of certain assumptions that may be at variance with the facts. Nevertheless, the study shows the trends and general order of efficiencies

It is concluded that the turbo supercharger is a serviceable piece of equipment for maintaining sea-level pressure at the carburetors when flying at altitudes. The indications are that extensive ground boosting can be used if the engine, spark plugs, fuels and carburetors are suitable for the application. Among the future developments suggested to improve the supercharger and attaching parts are listed:-Application to air-cooled engines, better materials for higher temperatures, improved disposal-system design to reduce pressure losses and improve installation, improved compressor-inlet design to take advantage of the forward airplane velocity and supply cooler air, investigation of divided exhaust manifolds, combination of geared and turbodriven installations using common impeller, improved cooling during and after compression, multiple stage compressors and turbines, improved methods of control such as varying nozzle area, means of maintaining highest possible exhaust temperature at nozzles, and improved turbine efficiency to maintain exhaust back pressure less than the carburetor-air pressure.

FUEL INJECTION SPARK IGNITION
Further Investigation of Fuel Injection with Spark Ignition in an Otto-Cycle Engine, E. S. Taylor and G. L. Williams S. A. E. Preprint. 8 pp., 17 fags. on supplementary sheets.

THE application of high-pressure fuel injection to two-cycle engines and the effects of late injection of the fuel upon the combustion process are investigated. The tests described indicated that with injection timings suitable for application to twocycle engines, that is, injection after the closing of the inlet valve, better power and fuel economy may be obtained than is possible with either early injection into the inlet pipe or with a conventional carburetor. In regard to fuel, it was found that gasoline or hydrogenated fuels of low volatility may be used with equally good performance. Ordinary low-grade Diesel fuels of low volatility may be used but with a performance inferior to that obtained with gasoline or hydrogenated fuel.

From these tests it appears that, with injection later than bottom center, a fair degree of directed turbulence is essential for proper distribution of the fuel through the combustion space and to insure sufficient homogeneity of the charge to obtain good combustion. Stratification of the charge with late injection is not only possible but to some extent unavoidable. The principal effects of stratification are a considerable increase in the range of useful mixture ratios, a marked improvement in fuel economy at best economy mixture, and a decrease in the maximum available power, all depending on the degree of stratification and characteristics of the injection valve. The highest useful compression ratio may be considerably increased by retarding injection to avoid detonation.

CHANGEABLE PITCH PROPELLERS
Controllable and Automatic Airco Controllable and Automatic Aircraft Propellers, D. A. Dickey and O. R. Cook, S. A. E. Preprint, 8 pp., 9 figs. on supplementary sheets.

SOME of the things that have been done and are being attempted in the design of controllable-pitch and automatic propellers are outlined by two engineers of the Propeller Unit, Materiel Division of the Air Corps. The different requirements of a changeable-pitch propeller when used on a cargo airplane and on a pursuit or combat plane are compared. Methods for producing and applying the forces required to change the blade angle are outlined and difficult problems not solved by experience in other fields of engineering are discussed, It is said that the stumbling block seems to be the lack of materials light enough in weight and of sufficient strength to permit the designer to get the propeller within the weight and space limitations established to date. The design of nine controllable propellers, in the development of which the Air Corps is aiding, are described and illus-

# THE LAIRD SPEEDWING

(Continued from page 76)

At Cleveland sufficient time was not available for installing the 20 x 4 racing wheels. Throughout the cross-country flight and races the original 650 x 10 Aircraft Products wheels were used.

While Major Doolittle had worthy competition during the races, it is to be noted that his first lap was made at a speed of 209 miles per hour. This lap, which was made before the engine trouble developed, was two miles an hour faster than the recorded speed of the winner of the race for the same lap.

As a result of the transcontinental performance of this ship we have received numerous inquiries on similar jobs to be used in spectacular performances. We propose to continue developing highspeed racing craft for special purposes and believe that the "Super-Solution" has proved itself to be another step forward in this type of ship.

The engine is fitted with a blower having a ratio of ten to one. Compression ratio is six to one.

The following list of specifications gives a general list of the dimensions and characteristics of the Laird Speedwing "Super-Solution":

| Span, upper wing21 feet           |
|-----------------------------------|
| Span, lower wing18 feet           |
| Chord, upper wing42 inches        |
| Chord, lower wing36 inches        |
| Total wing area112 square feet    |
| Overall height 6 feet 6 inches    |
| Overall length19 feet 6 inches    |
| Wheel tread4 feet 5 inches        |
| Propeller diameter (direct drive) |

8 feet 3 inches Propeller diameter (geared drive) . . 9 feet Fuel capacity......112 gallons Oil capacity......11 gallons

Engine (Pratt & Whitney Wasp Junior)......510 horsepower

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# Approved Type Airplanes Now in Production (Continued from Sept. Issue of Aero Digest)

Specifications: Span, 42 feet 3 inches. Length overall, 27 feet 10 inches. Height overall, 9 feet 9 inches. Wing area (includ-ing ailerons), 239 square feet. Wright J-6 Whirtwind 240 horsepower. Power loading, 13.95 pounds per horsepower. Wing load-ing, 14.01 pounds per square foot. Weight



# RYAN FOURSOME C-I

Detroit Aircraft Corporation

empty, 2,133 pounds; gross weight, 3,350 Performance: High speed, 130 miles per hour. Cruising speed, 105 miles per hour. Rate of climb, 800 feet per minute. Service ceiling, 14,000 feet. Radius, 615 miles. Gaso-

line capacity, 70 gallons. The framework of the fuselage is con-structed of welded steel tubing covered with sewed fabric. Conventional ailerons and of the wings is built of wood, glued spruce in two panels, covered with sewed fabric.

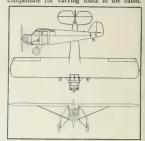
The landing gear is of the conventional split-axle type, equipped with Bendix brakes and oleo struts. Starter is Eclipse hand inertia and propeller is Hamilton-Standard.

The Ryan Foursome accommodates four persons. The volume of the baggage compartment is five cubic feet. The seats are arranged in two sets side by side. Dual side-by-side controls are provided.

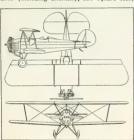
The areas of the tail surfaces are as follows: fin, 8.9 square feet; rudder, 9.5 square feet; stabilizer, 27.5 square feet; elevator, 17 square feet. The area of the

ailerons is 20 square feet.

The stabilizer is adjustable in the air to compensate for varying loads in the cabin,



Specifications (Model P-2A): Span, 29 feet 10 inches. Chord, 63 inches. Incidence, both wings, 2½ degrees. Dihedral, upper wing, 1½ degrees; lower wing, 2½ degrees, Length overall, 22 feet 10 inches. Height overall, 9 feet 3 inches. Center section span, 72 inches. Wheel tread, 65 inches. Wing area (including ailerons), 251 square feet;



# RYAN

# SPEEDSTER P-2, P-2A

Detroit Aircraft Corporation Detroit, Michigan

aileron area, 34 feet; rudder area, 7 feet; fin, 4 feet; stabilizer area, 27.4; elevators, 16.9 feet.

Wing loading, 8.36 pounds per square foot. Power loading, 14.41 pounds per horsepower. Weight empty, 1,483 pounds. Useful load, 897 pounds. Gross weight,

2,380 pounds.

The P-2A is powered with a Wright J-6, 165 horsepower engine, the P-2 with an Axelson 7-cylinder 115 horsepower engine.

Performance: (P-2A and P-2, respectively) High speeds, 117, 112 miles per hour.

Cruising speed, 90, 87 miles per hour. Climb at sea level, 725, 650 feet per minute. Service ceiling, 13,000, 11,000 feet. Cruising range, 470, 450 miles.

The Ryan Speedster is a three-place dual.

The Ryan Speedster is a three-place dual control, advanced training biplane. The fuselage, tail surfaces and landing gear are constructed of welded steel tubing, fabric covered. The ailerons and the wings are of

wood. The wing section is a modified Aeromarine. Equipment includes Rusco shock struts and Bendix brakes. Instruments and accessories are: tachometer, oil temperature and pressure gauges, altimeter, air speed indicator, compass and booster magneto. Easy access to the front cockpit is pro-

vided through a small door at the left side.



S pecifications: Span, both wings, 28 feet. Length overall, 22 feet 11 inches. Height overall, 8 feet 8 inches. Wing area, 233.4 square foot. Wing loading, 8.37 pounds per square foot. Power loading, 15.69 pounds per horsepower. Kinner B-5 engine of 125 horsepower. Weight empty, 1,164 pounds. Useful load, 786 pounds. Gross weight,



# VIKING

KITTY HAWK B-8 The Viking Flying Boat Company, New Haven, Connecticut

1,950 pounds.

2,380 pounds.

1,950 pounds.

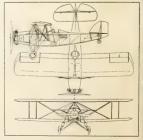
Performance: High speed, 112 miles per hour. Cruising speed, 88 miles per hour. Landing speed, 42 miles per hour. Rate of climb, 500 feet in forty seconds. Ceiling, 15,300 feet. Radius, 450 miles.

The fuselage is constructed of seamless steel tubing with welded joints. The wings are of wood and fabric construction with spars and ribs of spruce. The lower wing is bolted to the fuselage, the upper wing is connected by means of cabane struts. In the wing the drag truss is standard square tie rod and spruce struts. Leading edges of the wings are duralumin covered. The alterons are interchangeable, of the enclosed type, actuated through push and pull tube. The stabilizer is one piece and adjustable from cockpit by means of push rod and lever,

The landing gear is of the split type with a tread of seven feet two inches. The axle is welded to the lower V struts, eliminating torsional strains.

There are two cockpits, the front afford-

ing room for two persons. Baggage compartment accommodating 4 pounds of lug-gage is located behind the rear cockpit. Altimeter, tachometer, oil pressure and temperature gauge and gasoline gauge are provided; other instruments upon request. The propeller is Hartzell wood. The plane is equipped with semi-balloon tires with brakes.



and the student who has gone so far as to search out a good flying school does not need to be told that there is a very definite place for him in the aviation industry.

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In advising prospective students to select a flying school with the greatest care, the Edgewater Flying Club outlines a mand practical plan for flight istruction which is considered one of the fairest and soundest systems of its kind.

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Chief Instructor, a man of rare ability and pror the aviation field. Airplane construction, repairin bling, engine overhaul, wing repairing, covering rigging, wire splicing, welding, care of parachutes, few of the aeronautical subjects taught.

Field Headquarters of the Edgewater Flying Club are at the Chicago Municipal Airport, 5250 West 63rd Street. This is one of the most important flying centers in the entire country. Members of the club are able to observe and study the operations of the Aeronautics Branch of the Department of Commerce, the Aero Division of the Illinois National Guard, the many supply and service companies, air mail companies and air lines.

In addition to the Chicago Municipal Airport, the club uses the Harlem Airport, only three minutes by air from the Municipal field, for training. This is done in order that beginning flyers will not be interrupted or endangered by other planes.

Licensed Transport Pilots and licensed aircraft only are used for student instruction. Also, approved type parachutes are provided. All planes are offered to members at cost. Flight instructors, likewise, are offered at cost and are available at all times. One of the new NB Trainers equipped with an 80 h.p. engine has just been purchased by the club. The new NB Trainer, incidentally, is known as one of the safest and easiest-to-fly planes on the market. It compares very favorably in performance with the Autogiro. Not only is it safer than most planes, but it is cheaper to operate. The saving in cost is passed along to the club members.

The Edgewater Flying Club have just recently been appointed distributors and dealers for Nicholas-Beazley and Great Lakes Aircraft Corporation, which makes it possible to purchase its planes at a considerable saving.

Some of the distinct advantages of the Edgewater Flying Club are low cost, efficient training, participation in club ownership and control, pleasant associations, accessibility to field and club rooms, research and experimental studies, glider construction and flying, continued use of the club's planes at low rates and for unlimited time, subscription to the club paper, etc.



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# RECENT PATENTS

HE following patents of interest to readers of Aero Digest recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, 1343 H Street, N. W., Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when ordering.

Auxiliary extensible wing for airplanes. Elden A. Turner, Graniteville, Mass. (1.815.814.)

Mooring-mast for airships. Joseph B. Strauss, Chicago, Ill. (1,815,936.)

Mooring apparatus for aircraft. Henry G. Gros, Oakville, Conn., assignor to Waterbury Tool Co., Waterbury, Conn. (1,816,-010.)

Aircraft especially of the amphibion type, including means for mounting engines thereon, Igor I. Sikorsky, College Point, N. Y., assignor to Sikorsky Aviation Corporation, Wilmington, Del. (1,816,129.)

Aircraft, including wing panel and fuel tank assembly for same. Igor I. Sikorsky, College Point, N. Y., assignor to Sikorsky Aviation Corporation, Wilmington, Del. (1,816,130.)

Landing gear for aeroplanes. Harry Cordy, Los Angeles, Calif. (1,816,143.)

Means for and method of cooling and ventilating airplane fans. Frank H. Gallagher, Chicago, Ill. (1,816,183.)

Airplane. Henry Ford, Dearborn, Mich., assignor to Ford Motor Co., same place.

(1,816,216.) Airplane, Harold A. Hicks, Detroit, Mich., assignor to Ford Motor Co., Dear-

born, Mich. (1,816,219.) Sliding oleo landing hook, Robert J. Minshall, Seattle, Wash., assignor to Boeing Airplane Co., same place. (1,816,228.)

Cabin ventilator. Frank R. Canney, Seattle, Wash., assignor to Boeing Airplane Co., same place. (1,816,314.)

Helicopter. William A. Clark, Oakland, Calif. (1,816,315.)

Propeller. Thomas A. Dicks, Pittsburgh, Pa., assignor to Pittsburgh Screw & Bolt Corporation, same place. (1,816,317.)

Aeroplane engine. Louis R. Spencer, West Hartford, Conn., assignor to Spencer Aircraft Motors, Inc., Hartford, Conn. (1.816.406.)

Flying machine. Juan de J. Santo, New York, N. Y. (1,816,616.)

Airplane construction. William H. Nelsch,

St. Louis, Mo. (1,816,653.) Wing spar for aeroplanes. Ralph W. Hilton, Wichita, Kans. (1,816,678.)

Aeroplane control. Charles McCarroll, Kinsport, Tenn. (1,816,688.)

Means for vertically raising and lowering aeroplanes. William Waddell, Los Angeles,

Calif., assignor to Dragon Fly Aero Corporation, Ltd. (1,816,707.) Airplane propeller. Harvey H. Hardin,

Maitland, Mo. (1,816,730.) Kite parachute. Milford Ater, Chillicothe,

Ohio. (1,816,814.)

Airplane. Sonia F. Few, Niagara Falls,

N. Y. (1,816,898.)

Parachute. James L. Brown, jr., Lancaster, Pa., assignor to Follmer, Clogg & Co. (1,816,927.)

Engine starting device for aeroplanes. Charles B. Kirkham, Garden City, N. Y., assignor to Eclipse Machine Co., Elmira Heights, N. Y. (1,816,976.)

Parachute. Francis H. Pickard. Boardman, Oregon, (1,816,986.) Aeroplane, Robert E. King, Granite

City, III. (1.817.007.) Aeroplane, Robert E. Krug, Granite City,

III. (1.817.008.) Airplane pontoon. Walter H. Wallraff,

St. Paul, Minn. (1,817,047,) Aircraft control. Charles E. Glessner,

Portland, Oreg. (1,817,074.) Aeroplane construction, John C. Mc-Fadyen, Lakeport, Calif. (1,917,089.)

Night aerial advertising sign or the like and fastening means therefor. Rohlfs, Forest Hills, N. Y. (1,817,268.)

Night aerial advertising sign. Roland Rohlfs, Forest Hills, N. Y. (1,817,269.) Airship. Johann Schutte, Berlin-Lichterfelde-Ost, Germany. (1,817,274.)

Wing for aeroplanes. Alexander Soldenhoff, Zurich, Switzerland. (1,817,275.)

Auto vent wing for aeroplanes. George W. Williams, jr., Temple, Tex. (1,817,281.) Aerial flare, Robert J. Anderson, Whitman, Mass., assignor to National Fireworks, Inc., West Hanover, Mass. (1.817,503.)

Propeller for aircraft. Thomas F. Hamilton, Milwaukee, Wis., assignor to Hamilton Standard Propeller Corporation, West Homestead, Pa. (1,817,556.)

Airplane and method of control. Rudolph H. Schroeder, Glencoe, Ill. (1,817,.651.) Aircraft sheet-metal seam. Herbert V. Chaden, Detroit, Mich., assignor to General Aviation Corporation, New York, N. Y.

(1,817,653.) Lighting plant for airport landing places. Vaclay Kolar, Modrany, Czechoslovakia,

(1,817,827.) Aerofoil for aeroships. Samuel E. Hitt,

Elvria, Ohio, (1,817,920,) Propelling device for aircraft and the like. William Stelzer, Chicago, Ill., assignor to American Propeller Co., Baltimore, Md.

(1,817,952.) Aeroplane wing. William Wait, jr., Garden City, N. Y., assignor to Curtiss Aeroplane & Motor Co. (1,817,956.)

Aerofoil operating mechanism. Howard R. Moles, Garden City, N. Y., assignor to Curtiss Aeroplane & Motor Co. (1,818,000) Controlling device for aircraft. Louis

Constantin, Paris, France. (1,818,044.) Aeroplane. Frederic F. Kookogey, New York, N. Y. (1,818,067.)

Automatic pilot, Elmer A. Sperry, Brooklyn, N. Y., assignor to Sperry Gyroscope Co., same place. (1,818,103.)

Means for controlling dirigible aircraft. Elmer A. Sperry, Brooklyn, N. Y., assignor to Sperry Gyroscope Co., same place. (1,-

Aeroplane. Harry Cordy, Los Angeles, Calif. (1,818,116.)

Apparatus for and method of launching, landing, and mooring dirigibles. Levi S. Howland, Oakland, Calif. (1,818,137.)

Dirigible coupling means. Levi S. Holland, Oakland, Calif. (1,818,138.)

Propeller for helicopterous aircraft. Jean Mellander, Brussels, Belgium. (1,818,238.) Aeroplane. Jean F. de Villard, East St. Louis, Ill. (1.818.309.)

Airplane. Randolph F. Hall, Ithaca, N. Y. (1.818.321.)

Airplane, Randolph F. Hall, Ithaca, N. Y. (1,818,322.)

Landing-gear. Lessiter C. Milburn, Wickliffe, Ohio, assignor to Glenn L. Martin Co., Cleveland, Ohio. (1,818,417.)

Metal-framed structure for aeroplanes. Harvey C. Mummert, Hammondsport, N. Y. (1.818,423.)

Aerofoil construction. Lewis G. Young. Bronxville, N. Y. (1,818,519.)

Aerofoil construction. Lewis G. Young, Bronxville, N. Y. (1,818,520,) Aerofoil construction. Lewis G. Young.

Bronxville, N. Y. (1,818,521.) Aeroplane. William Snee and Morris Bell,

West Elizabeth, Pa. (1,818,588.) Airplane flotation system. Harry W. Adams and Frank M. Salisbury, Dundalk, Md., assignors to Glenn L. Martin Co., Baltimore, Md. (1,818.597.)

Airship mooring mast gear. Archibald Hall-Brown, Purley, and Edwin W. Jones. Lincoln, England, assignors to Babcock & Wilcox, Bayonne, N. J. (1,818,603.)

Radio dynamic control of gliding bodies. John H. Hammond, jr., Gloucester, Mass. (1.818.708.)

Aircraft. Lawrence J. McCarthy, Ogdensburg, N. Y. (1,818,809.)

Air mail catcher and refilling device. Henry Zimmerman, St. Louis, Mo. (1.818 --

# FABRIC FASTENERS

DEVICE for attaching fabric to air-A foils by means of duralumin or stainless steel clasps, particularly for fastening or clamping the covering fabric to the metal ribs of airplane wings, has been invented by Michael N. Matveyeff. The apparatus was recently tested in the laboratory of the Sikorsky Aviation Corporation, Bridgeport, Conn.

In ordinary practice the fabric is attached by tying it with cords which are drawn through the wing by means of long needles. The mechanism devised by Mr. Matveyeff for replacing this method consists of an operating handle and a magazine for clasps. The machine is held and slid along the fabric directly over the cap strip with one hand while being operated by the other hand. A guide groove assures alignment and a spacing guide makes accurately spaced fastenings positive. A clasp which stradles the cap strip is sent through the fabric and locked around the cap strip, leaving a smooth surface on top and a hole in the fabric smaller than the average hole left in twine-sewn fabric. A safety catch is provided.

# DAWN OPPOSED ENGINE

ESTS of a five-cylinder radial, four-cycle, air-cooled aircraft engine of the opposed piston type have been conducted by the Dawn Motors, Ltd., of Los Angeles, Calif. This engine, which was constructed as an experimental model, after 700 hours on the test stand, developed no trouble except oil leaks due to blow holes in the castings. During the initial test aviation gasoline poured directly in front of the exhaust manifold and onto strips of wing fabric failed to ignite while the engine was running at high speed, according to the

report made by the Dawn company.

Present plans include the construction of a seven-cylinder, four-cycle, radial aircraft powerplant of the opposed piston type similar to the five-cylinder engine with which the experiments have been conducted. This engine, which the company plans to produce on a commercial scale, will have a six-inch ore, a 3.75-inch crankshaft stroke, a piston displacement of 1484.38 cubic inches, a weight in excess of 300 pounds, and a horse-power approximating 300.

The Dawn engine has two opposing

Front view and longitudinal section of the 90-110 horsepower Dawn aircraft engine

pistons in each cylinder, the outer pistons serving as a moving cylinder head. There are no cylinder heads, the cylinders being open at both ends. The movement of any piston in the cylinders automatically moves the opposing piston in the opposite direction, resulting in the reduction of tendency toward roughness.

There is little inclination of the engine to rotate in the direction opposite to the crankshaft, the same amount of thrust being applied on the opposite sides of the crankshaft at the same time and from one positioned point, which is the cylinder. This results in a push and pull in the crank throws which tend to twist the shaft and the propeller.

All the energy of the expanding gases is directly applied to the motion of the pistons which act as two moving walls and twist the crankshaft, no part of the energy being lost in the thrust against the main bearings or in the effort to blow off the cylinder. The Dawn engine is designed to overcome the factors which produce vibration, and a saving of about eighteen per cent in fuel for power is developed. Expanding rapidly in both directions, the exploding gas burns itself out with the valves closed during the power stroke.

The two pistons push and pull the crankshaft at the same time, giving balanced inertia of all motion and climinating the need for counterbalancing the crankshaft. All valves are of the poppet type and are interchangeable. The compression ratio may be changed by adjusting the distances between the piston. The engine has a solid one-piece forged crankshaft and is provided with a new type of connecting rod assembly. This engine has driven a Paragon club propeller eight feet six inches in diameter at 1,000 r.p.m. continuously for seven hours on ten gallons of aviation gasolies.

# Specifications

| DP CONTENTIONS                    |       |
|-----------------------------------|-------|
| Bore4.125 i                       | nches |
| Stroke                            | nches |
| Piston displacement501.15 cubic i | nches |
| Horsepower at 1,300 r.p.m         | 90    |
| Horsepower at 1,450 r.p.m         | 110   |

# METAL WING RIBS

THE Edward G. Budd Manufacturing Company of Philadelphia and Detroit, is now in production on light sheet metal risbs for airplane wings. These ribs are made of stainless steel, electrically welded in accordance with the Budd company's design. This type of construction has been approved by the Department of Commerce.

Its characteristics are light weight, strength, durability and freedom from fatigue and deterioration. The ribs are designed in such a way as to be suitable for quantity production.

The Budd company was the originator of all-steel construction in automobile bodies and has, during the past sixteen years, built over 6,000,000 bodies of this type for manufacturers of popular cars. The company is closely associated with the Budd Wheel Company.

# JOINING THE CATERPILLARS

# Brief Accounts of Emergency Jumps which Won Membership in This Unique Organization

**F**OUR more names were added to the Caterpillar Club roster during the National Air Races of 1931, in which stunts and speed races put heavy strains on planes and pilots.

W ALTER J. HUNTER, one of the Hunter brothers of endurance flight fame, was testing his racing plane at the Cleveland Airport on September 6 when it caught fire and forced him to take to his parachute for safety.

The pilot had flown in from Terre Haute, Indiana, and had made some adjustments on his racer. He took it up for final adjustments before entering the Thompson Trophy race and was giving it a try-out in the early morning in front of the empty grand stands. He had been around the course and was turning a pylon when one fuel tank ran dry. He turned on a second tank and then, when the motor did not respond, a third one.

Suddenly a sheet of flame swept up through the cockpit, burning Hunter's hands so that he was forced to remove them from the control stick. The fire burned his neck and face where he was not protected by the flying suit. It was impossible to control the plane; it was traveling at 200 miles an hour and had an altitude of only 150 feet. So Hunter pushed himself from the cockpit and took to his parachute.

It opened beautifully, Hunter said. The wind blew out the flames on his clothes and he landed safely about thirty feet from his plane.

On September 1, Lieut. Thayer S. Olds of the First Pursuit Group, Army Air Corps, jumped when his plane became unmanageable over Bay Village.

He had taken off from the Cleveland Airport to join a group of Army fliers at a nearby port. He was flying an old plane which had been used for testing various equipment and which had been pressed into service because of the shortage of planes. It is believed the frequent drilling of holes for fittings had weakened the structure of the plane. Over the lake one of the motor mountings became loosened. The pilot throttled down but the motor continued to shake loose. Finally he was forced to bail out. He landed in the lake near the shore and waded out unhurt.

L IEUTENANTS L. H. Sanderson and W. O. Brice, marine pilots, joined the ranks of those who have saved their lives by parachute when their planes collided in an exhibition flight over the Cleveland Airport. A grand stand crowd of approximately 30,000 witnessed the accident and the safe landing of the pilots.

The two fliers were a part of a group of nine marine planes which had gone through intricate maneuvers to demonstrate fighting tactics to the visitors at the Races. Sanderson was leading the flight and Brice was second in command. Near the end of the flight the marines

Official U. S. Air Corps photo Lieuts. Sanderson (left) and Brice (right) receiving Caterpillar pins from Secretary Ingalls of the Navy

had started a snake dance, a difficult performance in which each plane copies the tactics of the leader. In a "squirrel cage"

formance in which each plane copies the tactics of the leader. In a "squirrel cage" turn the two planes collided. The stands saw a wing flutter off and the planes start their plunge to the ground. In a few seconds both planes sprouted parachutes and the pilots descended safely.

The demonstration was being broadcast and the announcer calmly explained to the crowd what was taking place. Later in the week, the pilots participated again in the same stunt maneuver in which they had crashed.

# Parachute Rules Revised

THE requirements to be complied with by manufacturers of parachutes in order that their products may be approved by the Department of Commerce and the regulations governing the licensing of parachute riggers are contained in a newly revised bulletin, which has just been published by the Aeronautics Branch. The bulletin is designated as

Aeronautics Bulletin No. 7-D, "Parachute Supplement of Air Commerce Regulations,"

In the revised bulletin, several additions to the specification and material strength requirements for approved type parachutes have been made. It is specified that fabric shall be free from gums. starches and foreign substances, and from imperfections that will lessen durability. Suspension lines are to consist of continuous cords, without splices or knots between connector links, and before being attached, the suspension lines are to be tested under 40 pounds tension. Machine sewing is to be done with a shuttle or plain stitch and zigzag sewing with a two-stitch zigzag sewing machine. The rip cord is to be designed to withstand a load of 300 pounds.

Two other amendments make clear the circumstances under which separate approved type certificates are necessary for slightly different models manufactured by one firm, or for a modified design of an approved type parachute. In either case, a difference such as the size or shape of the canopy, type fabric of the canopy, or type of harness will be considered sufficient to warrant issuance of separate approved type certificates.

In general, the procedures, respectively, for obtaining approved type certificates for parachutes and for obtaining parachute riggers' licenses, are the same as heretofore. In order to be eligible for a Department of Commerce approved type certificate, as outlined in the bulletin, a parachute must either have been approved previously by the army or navy, or it must undergo tests by the Aeronautics Branch designed to ascertain its strength and dependability. These tests include examination as to the strength of the material, the connection of suspension lines, and the construction of the harness.

When these requirements are complied with satisfactorily, the parachute is dropped from altitudes varying from 500 feet to 2,500 feet, first with a 170-pound dummy, and then with a 600-pound lead weight, and finally is tested under working conditions in a drop with a 170-pound man. The descent of the parachute is timed from the time of its opening until the ground is reached. The rate of descent, which shall not exceed twenty-one feet per second, is judged by the dropping of a 170-pound dummy man.

Applicants for a parachute rigger's license are examined on the Air Commerce Regulations and must show sufficient knowledge of parachutes to inspect, maintain, repair and pack them properly.



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| 1 | Address                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
| 1 | City                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |

# THE AIR SERVICES

# AIR CORPS BUYS NEW EQUIPMENT

T HE War Department recently announced the award of contracts totaling \$2,571,757 for the purchase of seventy-one planes from four aircraft manufacturers and ninety-two aircraft powerplants from an aircraft engine company.

The Boeing Airplane Company of Seattle, Wash., was awarded a contract for the construction of seven new type low-wing, all-metal, bi-motored Air Corps bombing planes valued at a total of \$696,324. This new bomber, developed recently by the Boeing plant, is reported to be faster than any present-day plane of its class. The plane is streamlined and is equipped with retractable landing gear. The first of these planes constructed by the company has been demonstrated to the Air Corps. It is powered with two P. & W. Hornet engines mounted on the wings. Previous to this Air Corps contract, the Boeing company was awarded a contract from the Navy Department for forty-five Wasp-powered F4B-3 fighters, which were in addition to thirty ships of the same type previously bought by the navy. This forty-five plane order, including spare parts, is valued at \$527,810.70. The navy fighters, designed for aircraft carrier duty, are single-place ships with fuselages of all-metal monocoque construction.

Among the aircraft manufacturers awarded contracts by the War Department in the recent \$2,571,757 order is the Curtiss Aeroplane and Motor Company, Inc., Buffalo, N. Y. A total of \$704,629 was involved in the purchase of forty-six P-6E pursuit ships. This plane will be powered with the Curtiss type V-1570-C 700-horsepower en-

Four transport planes were purchased from the American Airplane and Engine Corporation, Farmingdale, N. Y., at a total cost of \$85,480. It is reported that this plane will be equipped with a Wright Cyclone environ.

Six observation planes and eight amphibions were contracted for with the Douglas Aircraft Company, Inc., Santa Montica, Calif., at a total cost of \$358,784. The ob-

servation planes, of the high-wing monoplane type, involved a total cost of \$159,653. The Douglas amphibions were ordered at a total cost of \$199,131. Each of the observation planes will be equipped with a Curtiss Gl-V1570-C engine and the amphibions will each be powered with two Wright T-6 aircraft powerplants.

Under the terms of the contracts awarded by the War Department, the Wright Aeronautical Corporation will construct ninety-two type V-1570-C engines for installation in the forty-six pursuit ships contracted for with the Curtiss Aeroplane and Motor Company. The extra engines will be used as spares for these ships.

The Boeing company recently reported that the production of P-12E pursuit planes for the Army Air Corps is progressing satisfactorily. The company has an order from the War Department for a total of, 135 Wasp-powered single-seaters of this type. The first planes on the contract have been completed and delivered to the Air Corps.

# Major Royce Receives Mackay Medal

MAJOR RALPH ROYCE was presented with the Mackay Medal by F. Trubec Davison, Assistant Secretary of War for Aeronautics, in ceremonies held September 17 at Washington, D. C. The medal was awarded for the most meritorious flight made by an Army Air Corps officer in 1930. The prize-winning achievement was a cross-country mid-winter flight by the First Pursuit Group from Selfridge Field, Mich., to Spokane. Wash., and return.

Major Royce's name will be inscribed on the Mackay Trophy, a silver cup offered in 1912 by Clarence Mackay.

# Navy Reserves Air Space

THE Navy Department has designated a naval air-space reservation and defensive sea area near the southern entrance to Tangier Sound in Chesapeake Bay, where, from October 5-20, inclusive, ordnance tests will be carried out by the Department on the cruiser Pittsburgh. While the experiments are in progress, aircraft are prohibited from op-

erating within a radius of five miles and surface craft within a radius of two miles of the center of the reserved area

Dummy aerial bombs will be dropped to determine the deck penetration that may be expected from the latest type of bombs and to test the design of bomb cases and fuses. Static explosive charges, representing the explosions to be expected from various types of bombs, will be detonated to study the destructive effects of bomb hits.

# Mobile Mooring Mast Contract

A CONTRACT for the construction of a mobile mooring mast at the Naval Air Station, Lakehurst, N. J., has been awarded to the Wellman Engineering Company, Cleveland, Ohio, for \$119,000, by the Bureau of Yards and Docks, Navy Department.

The mast is designed to move over a pair of standard gauge railroad tracks. In its construction will be incorporated the experience gained through the use of a similar mast recently delivered to Lakehurst, as well as experimental features developed by the contractors for this mast.

The mast will be delivered to the Naval Air Station, Lakehurst, in about seven months where it will be installed and tested. Later, it is contemplated, it will be disassembled and shipped to Sunnyvale, Calif.

## Navy Pilots Qualify on Landings

FLIGHT OPERATIONS for the purpose of airplane pilot qualification and refresher operations were recently conducted on the aircraft carrier Saratoga, thirty-three pilots being qualified within a period of three days without injuries to personnel, according to a recent announcement of the Bureau of Aeronautics, Navy Department. Twenty-three pilots qualified in original carrier landings and ten in refresher carrier landings. A total of 127 landings was

accomplished.

In flight operations held recently on the aircraft carrier *Lexington*, forty-seven airplane pilots qualified in carrier landings on a single day, a total of 195 landings being





U. S. Army Air Corps photos by J. L. Albright

Two of the Air Corps Squadrons which participated in the National Air Races; (left) "Black" Squadron, Lieut. John S. Griffith commanding and (right) "Red" Squadron, Lieut. Harry A. Johnson commanding

остовек, 1931



(This notice originally appeared in the June 1931 issue of Aero Digest to which there was a warm and widespread response from wartime aviators, from all parts of the morld.

It is published again, solely to bring it to the attention of those "pilotes," their families and friends, who did not see the earlier announcement, so that they may have an opportunity to join this moveto commemorate and mark the birthplace of American wartime aviation in France.)

# TO ISSOUDUN ALUMNI THROUGHOUT THE WORLD

HIS appeal is a sort of rite in memory of our exalted dead who confided their last dream to France at old Issoudun in 1917-1918 and 1919. Then the cemetery and the monument beside it (erected by the French on ground given by a French family, but paid for by funds from the Plane News, officers and enlisted personnel at the 3rd A. I. C.) were only a kilometer from us. Today they are thousands of miles away. Our Buddies who wrote "finis" on the last page of their young lives, and wrote it in their blood, are not forgotten tonight nor were they neglected then.

Twelve years have fallen in on the Issoudun-Vatan road from then to now. More years, with their formations of days, will fall in as time flies by. They will carry us further from Issoudun. But may the assembling years, with their flight of days carry us not an inch from the memory of our dead Alumni.

The twelve years have been severe on the monument. It's a patched monument now split by frost" writes Jack Niles, and Major Bob Walsh tells us of its neglected condition. They both agree that the French estimate that about five hundred dollars can restore it.

Already we have been asked: "How much do you need?" We appreciate that spirit, but we would not be true to ourselves if we failed to remember that that monument was erected by voluntary contributions from the Alumni of Issoudun and it's our heart's desire to restore and care for it from voluntary funds now.

And so we renew liaison with all the Alumni of Issoudun by this appeal. We ask each member of the Alumni in different parts of the world to write a letter and enclose a check for two dollars to Aviators' Post No. 743. These two dollars will report at headquarters for you. They will show you are present and accounted for. They will show you are not missing from roll call.

> Colonel Harold Hartney Major Walter Kilner Arthur Butler Frank A. Tichenor Father John Sullivan

> > Issoudun Monument Committee

#### Women's Air Association Sponsors Garden Benefit for Convalescents at Selfridge Field Hospital

MEMBERS of the Women's Aeronautical Association of Detroit, Mich., sponsored a garden party on the afternoon of August 25 to raise funds with which to buy comforts for the convalescent patients at the new field hospital at Selfridge Field, Mich. The affair was held at the home of Mrs. Bruce Wark on Fairway Drive, facing the fairway of the Detroit Golf Club, over which members of the First Pursuit Group staged a series of aerial maneuvers during the afternoon.

Although the hospital has been equipped with every needed surgical device, the women did not feel that sufficient comforts had been supplied for officers and men who are recovering from accident or illness, and asked permission of the Commanding Officer, Major George H. Brett, to add easy chairs, drapes and pictures. Not only was this permission given, but the officers from the post assisted and attended.

The entertainment included bridge and a series of raffles and auctions. In the evening a chicken dinner was served. The affair was quite successful, several hundred dollars being raised.

The Women's Aeronautical Association of Detroit is composed of the wives of other women relatives of men engaged in aviation activities. This entertainment was held under the direction of the special events committee, of which Mrs. Ray Cooper is chairman. The chairman of the day was Mrs. J. A. Nowicki.

Other members of the committee are: Mrs. Harry Russell, Mrs. Edward J. Hill, Mrs. Ed Schlee, Mrs. Howard Hartung, Mrs. F. R. Anderson, Mrs. Floyd Evans, Mrs. George Goin, Mrs. Wm. C. Naylor and Mrs. Sid Erwin.

#### Fly New Naval Patrol Seaplanes

CONSTRUCTION of twenty naval patroscopic applanes for the Bureau of Aeronautics, Navy Department, was recently completed by the Glenn Martin Company, Baltimore, Md. These ships will be attached to the U. S. S. Wright, aircraft tender, and will operate from the Fleet Air Base, Coco Solo, C. Z.

Following the delivery of these ships to the Navy, personnel flew them in groups of three or four from Hampton Roads, Va., to Coco Solo, via Jacksonville and Key West, Fla., and Trujillo, Honduras.

# Construction at Air Corps Flying Fields

CONSTRUCTION work at a number of Air Corps flying fields has been authorized under a program of general development of Army establishments throughout the country, according to recent report issued by the War Department. Contracts involving a total of \$2,000,000 have been awarded for work at forts, barracks, military parks and aviation fields.

Improvements at Air Corps flying fields include the following:

Randolph Field, Texas.—Irrigation pumping equipment, \$1,606; deep-well pumps, \$8,761; booster pumps, \$2,247.50; sprinkler

irrigation system, \$15,400; insect screen for windows, \$12,500; door screens, \$8,610; street lighting, \$14,125; and street paving, \$128,050.72

Selfridge Field, Mich.—Water supply main, \$26,000; sewerage plant and pumping station, \$15,225; and machine shop, assembly shop, warehouse and four hangars, \$223,955.

Mitchel Field, N. Y.—Warehouse, \$20,-

Middletown Air Depot, Pa.—Exterior walls of warehouse, \$18,362.

# Air Corps Designs Runway Marker

E XPERIMENTS with airport lights designed to outline runways and indicate unsafe ground areas, but which would not form an obstacle to airplanes taxying or landing over them, were recently conducted by the Army Air Corps at Wright Field, Dayton, Ohio.

Three commercial types of floodlights were tested. These consisted of an incandescent lamp placed at the focal point of a parabolic reflector and housed in a wateright casting fitted with a heavy glass door. These units were installed with the lens level with the ground. Tests showed that the light distribution, the beam being vertically upward, was not satisfactory. It was necessary to fly fairly high above the lights before they became apparent. To a pilot flying low over the field and approaching from a side angle, they were scarcely apparent.

The Air Corps designed and tested a unit called a runway marker light which proved to be the most satisfactory yet tried out for this purpose. It consists of an incandescent lamp placed in a glass cylinder which is installed in a water-tight, protec-

tive, metal casung. The cylinder is five inches in diameter, the whole casting twelve inches in diameter, and it extends four inches above the ground level. The metal cap which tops the glass cylinder and the elevation of the cylinder four feet above the ground level cause a diffusion of the light beam sideways across the level of the field and upwards to an angle of forty degrees. A white light is used to denote runways and a red for ground obstacle marking.

# Martin XP2M-1 Patrol Flying Boat

TEST flights of the XP2M-1, a Martin trimotor patrol flying boat, were conducted recently by the Navy Department at the Naval Air Station, Anacostia, D. C. This flying boat has been developed to be self-sustaining so that its crew may live on board for a considerable length of time with no outside assistance other than the provision of fuel and food. Three spacious compartments are incorporated in the construction of this plane and each is provided with full-size bunks, fresh water and cooking facilities. The Martin flying boat is designed for long cruises over the ocean and to carry a heavy load of bombs.

It has been more than twelve years since the Navy has had a plane of greater size, the NC type, which made the first trans-Atlantic air crossing in 1919. In speed, cruising range and general suitability, the Martin patrol boat is reported superior to its long-range prototype, the NC flying boat,

#### Selfridge Field Construction

NEW construction work is under way at the Air Corps post, Selfridge Field, Mich. The new structures include four new hangars, headquarters building and quarters for officers and non-commissioned officers.

# PHOTOMETRIC TUNNEL AT WRIGHT FIELD

A 260-foot tunnel for the testing of various types of aircraft lights, including beacons, floodlights, landing lights and airdrome marker and boundary lights was recently set up in the basement of the main laboratory at Wright Field, Dayton, Ohio. Constructed of galvanized sheet metal, painted black on the inner side, this tunnel when all lights are turned off is darker than any night. At one end is a platform, eight feet in diameter, upon which the light to be tested is mounted. which revolves, and which may be raised or lowered any amount desired to bring the light beam in a direct line with a photometer, the instrument used for measuring the light intensity. The photometer is mounted on a truck which moves on rails and may be brought as close as four feet or as far distant as 250 feet down the tunnel from the light. Black screens, with center circular cutouts decreasing in diameter are placed at regular intervals down the length of the tunnel. These screens are for the purpose of shutting away from the photometer the diffused rays of light and focusing upon it the direct beam. Since

the platform revolves, the light may be tested from all sides and it can be so mounted as to be tilted to any angle.

The routine testing of various kinds of lights in use by the whole Air Corps is carried on in this tunnel. But routine testing is exceeded in amount by the testing of new and experimental types of lights. Formerly the proper mounting of these lights and the obtaining of satisfactory test data concerning them was a long-drawn-out business. In the photometric two men can do the work in two or three hours, which formerly required eight to ten hours to complete.

On the beacon at present installed on the platform, an experimental type, four separate tests are being run; one with beam spread vertically, one with split beam, one without lens, and one with a mew type of pressed glass lens. Recently a new type of airplane landing light was received in the tunnel for testing which, consuming but one-fifth of the energy of the two-million candlepower beacon, gave one-half the light intensity. It is upon the report of these tests that decisions as to the adoption of lights for standard Air Corps use largely depend.

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# AERONAUTICAL INDUSTRY

# Notes of Appreciation from Air Race Officials to the Aeronautical Industry

National air Races, inc., the non-profit or-ganization which sponsored the 1931 event in Cleveland, spicerely appreciates the aviation industry in making a success of the first of a series success of the first of a series of air races to be held at that city. The wholehearted sup-port of all associated with the business of flying was evident from the formulation of the first plans until the final race was flown, and for this gener-ous assistance we wish to extend our sincere thanks

Believing thoroughly in the value of the Races as an incentive to the production of superior aircraft and piloting skill, it is our hope that we will be able to contribute as much to the aeronautical industry as the industry has contributed to the National Air Races.

L. W. Greve. President.

T HE 1931 National Air Races truly interpreted the needs of the aircraft industry as expressed by the industry's executives, engineers and pilots at the several zone meetings held during February this year. The many entries in all events is proof of this fact. There can be no justification for this annual air classic unless it does encourage engineering genius and pilot skill and the Race

Committee invites the constructive reactions of the entire industry for the ensuing

I believe the participating and visiting aircraft industry can take pride in the safe operations record this year, which I trust will result in a broader confidence in and acceptance of aviation by the layman public.
Clifford W. Henderson,

Managing Director.

I T has been a pleasure for the Contest Committee to work with all contestants, and we wish to take advantage of this opportunity through the courtesy of Aero Digest to thank you for your co-operation and assistance in making our program the success it was.

We also wish to thank

every man who served on the various committees in connection with the Contest Department. The efficiency of this department depends solely upon the committeemen, and while lack of space does not permit me to mention each individual's name, the Air Race Corporation is deeply grateful to all those men who labored throughout the entire period of the Races. We also wish to commend them upon their courteous treatment of the contestants and visiting

pilots.
E. W. "Pop" Cleveland, Contest Chairman. Bleriot to Offer Speed Trophy

LOUIS BLERIOT, the first man to fly across the English Channel, announced recently that he would donate a cup bearing his name to anyone capable of maintaining for half an hour a speed of 400 miles per hour. The speed may be attained in the air, on the water or on the land, according to the conditions of award, but Mr. Bleriot said duobtlessly the award will be won by means of aircraft. The Bleriot Cup, which will be ready within two years, would pass to other hands if the holder's record is exceeded by five per cent and into permanent possession for a speed of 650 miles per hour.

#### Oil Executives Fly 11,985 Miles on Company Air Tour

TO increase business through direct contact with customers, six marketing executives of the Continental Oil Company have completed a seventy-eight-day aerial tour of 11,985 miles, crossing thirty states, two Canadian provinces and making short flights over the Atlantic, the Pacific, the Gulf of Mexico and the Great Lakes, according to a recent company report.

Unhampered by the necessity of adhering to train or bus schedules and aided by the speed and reliability of their aircraft, tour members flew hundreds of miles each day regularly and yet spent the greater part of their time on the ground engaged in business activities. On one day, the group traveled 900 air miles and spent six and one-half hours at work on the ground.

Adverse weather conditions resulted in delay only once. Two minor adjustments totaling three hours and twenty minutes comprised the only mechanical delays. The tour was made in the Conoco Ford trimotor cabin monoplane and a Curtiss Robin cabin plane, both ships being loaded to capacity on practically every flight. On a comparative cost and efficiency basis, it was estimated that a saving of at least fifty per cent was effected by using aircraft on the tour.



Clifford W. Henderson



E. W. "Pon" Cleveland



L. W. Greve

# DIGEST OF RECENT EVENTS

A Brief Chronological Summary of the Month's Important Aeronautical News

German Fliers

(Portugal.) The German pilots, Willy Rody and Christian Johanssen, arrived at Portugal on the first leg of a projected transatlantic flight to the United States. The left Berlin two days previously. (August 24)

New York-New Orleans

A new record of seven hours and fourteen minutes for a non-stop flight of 1,185 miles between New York and New Orleans was claimed by James Goodwin Hall and Andre de Coppet, passenger. (August 26)

# Captain Hawks

Seven new inter-city airplane speed records on short flights between Atlanta, Ga, and Newark Airport, N. J., were set by Capt. Frank M. Hawks. For the 803 miles he required four hours and eight minutes total flying time at an average speed of 192 miles per hour. The records were formerly held by regular passenger and mail planes. (August 26)

Lindberghs

(Japan.) Colonel and Mrs. Lindbergh landed their Lockheed Sirius monoplane seaplane at Kasumigaura naval base, Tokio, Japan, official terminus of their 7,132-mile flight from the United States. The Jeff Washington, D. C., on July 28 and started on an air tour to the Orient via New York, Canada, Alaska, Siberia and the Kurile Islands, where they made several forced landings before reaching Japan. They did not follow a fixed schedule. (August 26)

# French Air Maneuvers

(France.) Two hundred planes of the French Air Force began four days and nights of continual maneuvers to test the attack and defense potentialities of the air and ground forces along the eastern frontier. (August 26)

Do. X

The German flying boat Do.X landed in New York harbor, completing a flight from Lake Constance, Switzerland, via Holland, England, France, Spain, Portugal, Canary Islands, the West African coast, South America and northward along the Atlantic Coast. (August 27).

# Italian Air Maneuvers

(Italy.) A total of 894 aircraft began maneuvers of the Italian Air Force over a period of several days to test Italy's air defense and the use of planes in mass formations independent of the navy and army. (August 28)

## National Air Races

The Eleventh Annual National Air Races were held at Cleveland Airport, Cleveland, Ohio. (August 29-Sept. 7) Germany-Chicago Flight

Under the command of Capt. W. Von Gronau, the Groenland-Wal, twin-motored airplane, completed at Chicago, Ill., a 4,000-mile flight from Westernland, Germany, via Iceland, Greenland, Labrador and Canada. The plane successfully weathered the dangers of sub-Arctic ice, areas of open sea, cold, treacherous winds and fog. Captain Von Gronau was accompanied by Edward Zimmer, co-pilot; Fritz Albrecht, radio operator; and Franz Hack, mechanic, the same crew on the Germany-New York flight made by Von Gronau in 1930 over the northern route in a five-year-old Dornier-Wal flying boat. The flight was made to obtain data helpful in the establishment of air mail routes via the sub-Arctic. (Sept. 1)

#### Coast-to-Coast Record

Major James H. Doolittle flew from Burbank, Calif., to New York (Newark Airport) in eleven hours and fifteen minutes, setting a new eastward transcontinental air record and winning the Bendix Trophy Race of the National Air Races. His average speed was 218.81 miles per hour, stopping for fuel en route at Albuquerque, N. M., Kansas City and Cleveland. The former record of twelve hours, twenty-five minutes and three records was established by Capt. Frank M. Hawks on August 13, 1930. (Sept. 4)

# Allen-Moyle Start

(Japan.) The American pilots Cecil A. Allen and Don Moyle took off from Sabishiro Beach on a projected non-stop flight to Seattle, Wash. (Sept. 7)

#### Italian Speed

(Italy.) It was unofficially reported that Flight Lieutenant Bellini, attempting to set a world's speed record for seaplanes in secret trials at Lake Garda, completed one leg of the course at 453 miles per hour. While attempting a turn, the plane struck a bank and was destroyed, the pilot being fatally injured. Italian authorities did not confirm the report. (Sept. 10)

#### Air Fiest

The Fiesta of the Air was held at the Los Angeles Municipal Airport, Los Angeles, Calif., in conjunction with La Fiesta de Los Angeles. (Sept. 12-13)

#### Philadelphia Meet

Flying eight times over a five-mile circuit at an average speed of 202 miles per hour, L. Bayles won the forty-mile free-for-all speed race at the American Legion Air Meet, Philadelphia, Pa. (Sept. 13)

# Trans-Atlantic Start

(Portugal.) In the Eso, a Junkers W. 33 mionoplane, the German fliers, Willy Rody and Christian Johanssen, and the Portuguese, Fernando Viega, took off at Juncal do Sol near Libson, on a projected 3,700-mile flight to New York. They carried fuel sufficient

for approximately forty-eight hours of flying. (Sept. 13)

# Schneider Trophy Race

(England.) Without competition from other nations, Great Britain won permanent possession of the Schneider Trophy with a new record for the race in a speed test at Calshot when Flight Lieutenant J. N. Boothman attained an average speed of 340.08 miles per hour over the triangular course. The first two laps, covered at an average speed of 342.9 miles per hour, made a new record for 100 kilometers. Flight Lieutenant G. H. Stainforth broke the world's record on the three-kilometer straightaway course with an average speed of 379 miles per hour. (Sept. 13)

# Air Corps Gunnery

The highest score ever made since the Air Corps began annual bombing and gunnery practice in 1925 at Langley Field, Va., was made during recent practice, the Air Corps announced. (Sept. 14)

#### Fly Tailless Plane

(Germany.) A tailless plane powered with a thirty-horsepower engine was test flown with successful results at Berlin-Tempelhof Airdrome. The performance included acrobatics, gliding with a dead engine and a speed of ninety miles per hour. (Sept. 14)

## Mooring Test

For the first time an airship attempted to moor to the mast on top of the Empire State Building in New York when a Goodyear blimp dropped a rope to a landing crew on the tower. The rope was grasped by the crew and held for approximately one minute during the experiment, after several attempts to effect the mooring in a fortymile wind. (Sept. 15)

## Speed Service

New extra fare limited air passenger transport service bringing Washington, D. C., and New York sixty-eight minutes apart by air was inaugurated by the Ludington Line. Two schedules each way daily will be operated. (Sept. 16)

#### Moyle and Allen

Seven days after they had been given up for lost on an attempted non-stop flight from Japan to the United States, Cecil Allen and Don Moyle were reported by three Soviet vessels to be safe on an uninhabited island on Alyutorsk Bay, Siberia. They had covered a distance of 1,200 miles from the starting point, being forced down by inclement weather. (Sept. 16)

# High-Altitude Plane

(Germany.) Construction was completed at Dessau of a Junkers airplane especially designed for high-altitude flying into the stratosphere, according to reports in the German press. A. Hansen, designer, expects the plane to attain an altitude of ten miles. The ship was built jointly by the German Scientific Society and the Experimental Institute for Aeronautics. (Sept. 18)

Lindbergh Flight

(China.) Colonel and Mrs. Lindbergh, on an air tour of the Orient, landed at Nanking, China, completing an 800-mile flight from Fukuoka, Japan, crossing the Yellow Sea en route. (Sept. 19)

Japan-Alaska

Japan. Alaska Moyle and Allen landed at Nome, Alaska, on a flight from St. Paul Island, Bering Sea. They decided to abandon an attempted non-stop flight from Japan to Seattle after being forced down on a deserted island for several days. (Sept. 20)

Graf Zennelin

(Brazil.) The Graf Zeppelin landed at Pernambuco on a transatlantic flight from Friedrichshafen, Germany, carrying ten passengers, mail, and a crew of forry-three, her third crossing to Brazil, under the command of Capt. Ernst Lehmann. The Zeppelin flew on a round-trip schedule from Germany and return. The crossing was uneventful and favorable weather was encountered. This flight followed a round-trip journey over the same route which the Zeppelin started from Germany on August 29. (Sept. 20)

The Esa

After floating for more than 148 hours on the open sea in the Junkers monoplane Bsa, Rody, Johanssen and Viege were picked up by the Norwegian motorship Belmoira and were reported safe on board. The fliers were sighted eighty miles off Newfoundland after they had been forced down on an attempted flight from Portugal to New York. The Esa was a low-winged all-metal Junkers monoplane, powered with a single water-cooled engine. (Sept. 21)

Navy Autogiro

Lieut. A. M. Pride, U.S.N., successfully landed an autogiro three times on the deck of the aircraft carrier Langley and three times completed perfect take-offs from the vessel. A landing run of less than fiften feet resulted on each trial, no vertical descents being employed. These tests were the first to be completed in the navy's program of experimenting with autogiros for use with the fleet. A passenger was carried on each flight, (Sept. 23)

Akron Tested

The first trial flight of the navy airship Akron were successfully completed at Akron, Ohio. A flight of three and three-quarter hours was made, carrying 113 persons. (Sept. 23)

Air Mail Anniversary

Ceremonies commemorating the twentieth anniversary of the United States Air Mail were held at Roosevelt Field, L. I. On September 23, 1911, Earl Ovington, flying a seventy-horsepower Bleriot, traveled from Nassau Boulevard, New Garden City, to the airport, then located at Mineola, and dropped two bags of mail. (Sept. 23)

Memphis-New York

Capt. Frank M. Hawks flew from Memphis, Tenn., to New York in four hours and fifty minutes, a new record. (Sept. 23)

# Trade Directory Shows Growth in Civil Aeronautics During Past Year

EXPANSION in the field of civil aeronautics during the year ended July 1, 1931, is shown in the new revised edition of the Aeronautics Trade Directory recently published by the Aeronautics Branch of the Department of Commerce. There is a total of 2,818 listings of firms engaged in the manufacture of aircraft or accessories, the operation of aircraft or in some business linked with the aeronautics industry. This represents an increase of more than 200 during the year.

There was an increase in the number of airplane manufacturers from 117 to 240 during the year, and aircraft engine manufacturers increased during this period from sixty-eight to eighty-five. Glider manufacturers increased from thirty-two to thirty-five and lighter-than-air craft manufacturers from eight to ten.

Scheduled air transport operators increased from forty-five to forty-nine. Flying services offering taxi flying, sightseeing and delivery remained practically constant in number—314 in the old bulletin as against 315 in the new. The number of schools remained the same— 385.

As some firms are listed two or more times, under different headings, the figure 2,818 does not represent the actual number of business organizations, but rather the total number of sources where the various products or types of service represented by the civil aeronautics indutry are available.

# U. S. Ranked First in Civil Air Strength and Fourth in Military

THE United States is ranked first among the leading powers in the number of civil planes and fourth in military air strength in a pamphlet recently published by Carl Byoir and Associates, New York City.

In number of civil planes, the United States is shown to be far in the lead, with twice as many as have the other leading nations combined. There are 10,235 civil planes in this country, according to the re-

port, as compared with 2,070 in the British Empire and 1,320 in France.

To France is attributed supremacy in the number of military planes, while the British Empire is second and Italy third. The following table is cited in the pamphlet to show national strength in the fighting airplanes of each country listed, including both active and reserve planes, but excluding experimental and obsolete aircraft:

Great Britain, 1,593; Dominions, etc., 472; British Empire, 2,065; France, 4,683; Italy, 1,834; Japan, 1,312; Russia, 1,520; United States, 1,809.

The British Empire, Russia and the United States spend the most for military aviation. France and Russia spend the most for civil aviation.

The pamphlet does not say how the figures were compiled, but declares that they were obtained from "authentic sources."

## Increase in Applications for Student Pilots' Permits

APPLICATIONS to the Aeronautics Branch for student pilots' permits increased more than fifty per cent in the second quarter of 1931 over the number of applications in the first three months of the year, according to a Department announcement. From April 1 to June 30, the Aeronautics Branch issued student permits to 4,674 persons as against 2,934 in the period January 1 to March 31.

Although this increase may be accounted for in part by the fact that flying conditions are better in the spring and summer months than during the winter, and therefore prompt more persons to begin their flying instruction, it is interpreted by the Aeronautics Branch as an indication of increasing interest in flying.

Statistics compiled for the second three months of 1931 show that 10,020 examinations were conducted during this period. Of this number, 3,977 were original examinations of students and 978, reexaminations of students. In 281 cases the applicants for student permits were disqualified for physical defects. There also were 106 original examinations for higher grades of licenses, and 4,959 reexaminations for higher grades. Of this total, eleven examination records were canceled or field without action.

# RESULTS OF THE NATIONAL BALLOON RACE

OFFICIAL CHECK of the logs of pilots in the National Balloon Race which started at Akron, Ohio, July 19, has been announced by the National Aeronautic Association as follows:

| Entrant                                            | Pilot and Aide                      | Place of Landing                                                                               | Distance             |
|----------------------------------------------------|-------------------------------------|------------------------------------------------------------------------------------------------|----------------------|
| U. S. Navy                                         | T. G. W. Settle<br>Wilfred Bushnell | .18 mi. ESE of Buffalo, N. Y                                                                   | 195 mi.              |
| GoodyearZeppelin Corporation                       | F. A. Trotter                       | . 9½ mi, NW of Buffalo, N. Y<br>.11½ mi. E of Welland, Ohio<br>3½ mi. NE of Stevensville, Ont. | 185 mi.              |
| Detroit<br>Balloon Club                            | E. J. HillA. G. Schlosser           | . 8 mi. E of Erie, Pa                                                                          | 110 mi.              |
| U. S. Army                                         | K. S. Axtater<br>H. H. Couch        | . 1 mi. E of Custards, Pa<br>.10 mi. S of Meadville, Pa.<br>5 mi. W of Cochranton, Pa.         | 80 mi.               |
| GoodyearZeppelin Corporation                       | L. P. Furcolow<br>J. B. Rieker      | . 4 mi. N of Ravenna, Ohio<br>5 mi. S of Mantua, Ohio<br>10 mi. NE of Kert, Ohio               | 18 mi.               |
| U. S. Army                                         | E. M. Fogelsonger<br>John A. Tarro  | 21/2 mi. NE of Brimfield, Ohio                                                                 | 11 mi.               |
| Distances given were s<br>submitted by each pilot. | caled by the U. S. Geolo            | gical Survey from data given on the                                                            | landing certificates |

#### Allard Heads Curtiss-Wright Flying Service—New Policy Announced

THOMAS A. MORGAN, president of the Curtiss-Wright Corporation, recently announced the election of J. S. Allard as president of the Curtiss-Wright Flying Service to succeed Major E. H. Brainard, resigned.

Mr. Allard, who has been vice president of Curtiss-Wright Export Corporation for three years, will retain his vice presidency. He immediately announced a change in policy of the flying service, which operates a chain of airports throughout the United

"In the past, we have had to pioneer, blazing the trail for air taxt, flying instruction and many other kinds of aerial service and we are continuing this policy as evidenced by our newly gratibiated houry, Air Ferry Service connecting artificial control of the property of the property

Mr. Allard said that the company will in the future concentrate on providing service, fuels, repairs, parts, airplanes, engines and instruments, distributing the products of the Curtiss-Wright organization and other types of airplanes, parts and accessories.

The Curtiss-Wright Flying Service, organized by Glenn H. Curtiss in 1910, operates thirty-two flying service bases and has 187 dealers in forty-five states, Mr. Allard stated.

# Southworth Named Official Winner of Detroit Balloon Race

BY A MARGIN of two miles Tracy W. Southworth has been officially declared winner of the Detroit News Balloon Trophy Race. Initial reports from the U. S. Geological Survey indicated that Southworth and Edward J. Hill both had covered 217 miles with G. M. Le-Gallee, Jr., a close third. More accurate determination of the exact point of landing favored Southworth, who landed at Option, Pa., 216.5 miles from Detroit. Hill's landing at Lowell, Ohio, established his distance at 214.22 miles, with LeGallee finishing at New Plymouth, Ohio, 206.25 miles. The start of the race was at Detroit on July 25. Balloons were of 35,000 cubic foot capacity.

Other competing pilots were: L. P. Furcolow, who landed at New Castle, Pa., 170 miles; George Hineman, at Blair, Ont., 160 miles; S. A. U. Rasmusen, Fowler, Ohio, 148 miles, and Roy Cunningham, Hartsgrove, Ohio, 125 miles.

# Air Violations Total 310 in Second

Quarter of 1931
THERE WERE 310 violations of the
Air Commerce Regulations dealt with by
the Aeronautics Branch of the Department of Commerce during the second
quarter of 1931, according to a recent
announcement of Gilbert G. Budwig,
Director of Air Regulations. Fines totaling \$500 were assessed and collected, and
\$1,025 was collected on civil penalties

previously assessed. During the second quarter, fines were assessed against ser-enty-nine persons. Penalties in the form of forty-nine reprimands, 103 suspensions, twenty-one revocations and five denials of licenses were imposed for violations. In fifty-three cases, evidence was produced which justified dismissal.

Violations of the Air Commerce Regulations dealing with acrobatics led the list of specific offenses. There were sixty-five violations of the acrobatics provisions and forty-four of the low flying clause of the regulations.

## Meetings of S. A. E. Held in Conjunction With National Air Races

THE Society of Automotive Engineers held its Twentieth National Aeronautic Meeting at the Hotel Statler, Cleveland, Ohio, on September 1, 2 and 3.

The meeting was arranged in conjunction with the Aeronautical Chamber of Commerce of America and with the coöperation of the Cleveland Section of the S.A.E.

Morning sessions were held at 10 o'clock and evening sessions at 8:30. Each meeting was devoted to the consideration of a single general topic. A Dutch Supper was held on the last evening.

# TUESDAY, SEPTEMBER 1 Morning Session. Engines. B. G. Leigh-

ton, chairman.
"Sealed Liquid-Cooling," by J. H. Geisse,

Comet Engine Corporation.

"The Turbo Supercharger," by O. Chenoweth and A. L. Berger, United States Army Air Corps. Wright Field.

Evening Session. Aircraft. William B. Stout, chairman.

"A Study of Airplane Vibration with Particular Reference to Vibration at the Instrument Board," by S. J. Zand, Pioneer Instrument Company. "A Rationalization of Load Factors for Airplanes in Flight," by J. S. Newell, Massachusetts Institute of Technology.

# COMING AERONAUTICAL EVENTS

October. International air mail conference, Brussels, Belgium.

October 5-10. National Congress of Colonial Aviation in conjunction with the International Colonial Exposition, Paris, France.

October 5-15. Tour of aeronautical and other industrial laboratories, auspices National Research Council. October 7-8. Production Meeting of the S. A. E., Book-Cadillac Hotel, Detroit, Mich.

October 8-11. First Annual All-Southern Aircraft Pageant, Charlotte, N. C.

October 22-November 5. Glider Contest, auspices Honolulu Chapter of the N. A. A., Honolulu, Hawaii.

October 27-29. Fall transportation meeting of S. A. E., Washington, D. C. WEDNESDAY, SEPTEMBER 2

Morning Session. Aircraft. C. H. Colvin, chairman.

"Speed," by Lieut C. B. Harper, U.S.N., Ret. "Progress of Autogiro Development," by A. E. Larsen, Autogiro Company of America. "Progress of Technical Development in Europe Looking Toward Increase Efficiency in Aircraft," by Lieut. Alford J. Williams

Evening Session. Engines. N. N. Tillev, chairman.

"Further Investigation of Fuel Injection with Spark Ignition in an Otto-Cycle Engine," by E. S. Taylor and George L. Williams, Massachusetts Institute of Technology. "The Development of an Apparatus for the Study of Combustion in High-Speed Diesel Engines," by A. M. Rothrock, National Advisory Committee for Aeronautics. "Magnesium Alloys in Aircraft Engine Construction," by G. D. Welty, Aluminum Company of America.

# THURSDAY, SEPTEMBER 3

Morning Session. Propellers. E. E. Wilson, chairman.

"Controllable and Automatic Aircraft Propellers," by D. A. Dickey and Lieut. O. R. Cook, United States Army Air Corps, Wright Field.

"Aeronautic Propellers," by F. W. Caldwell, Hamilton Standard Propeller Corporation

Evening. Dutch Supper. Hon. David S. Ingalls, Assistant Secretary of the Navy for Aeronautics, toastmaster. Speaker, Lowell Thomas, "With Lawrence in Arabia."

FEDERALLY approved flying schools may permit prospective students to handle the controls of aircraft on demonstration flights, according to a recent announcement of Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics. No more than two such demonstration flights shall be given each prospective student and the aggregate time may not exceed thirty minutes. These flights must be conducted by transport pilots holding flying instructors' ratings and employed by approved schools.

#### Return from Aerial Survey of Labrador

C OMMANDER DONALD B. MacMIL-LAN and Pilot Walter Rocheville recently returned to Rockland, Me., from Labrador where they have been since July 8, mapping part of the coast line and flying over unexplored interior. They used a Lockheed Vega powered with a Wasp, Jr. engine. With the exception of grasing rocker arms, adjusting valve clearances and spark plug gaps the engine required no attention during 200 hours of flying.

From headquarters at Anetalak Bay, the expedition made aerial photographic trips up and down the coast every clear day. Only nine hours of photographic flying were accomplished during the two months because of the extremely foggy weather. However, in these nine hours, from 1,500 to 2,000 square miles of coast line were mapped. The negatives will be used by the Geo-

graphical Society for constructing charts of which there are none at present. The photographic work was done by J. A. Newcomb.

Most of the flying was made over land never before seen by white men. A compass was useless because of the large deposits of magnetic ore in the mountains. The farthest north flown by MacMillan and Rocheville was at Eclipse Harbor, 50 degrees north latitude. On two occasions when an offshore wind sprang up after they had landed at the head of a fjord, they were forced to taxi twenty miles out to open water because of the down draft coming off the hiele (lifts on either side.

# NORTHEAST

A NEW flying club at Portland, Me, is being formed by Stanford B. Chanler, manager for Curtiss-Wright, and Charles N. Cutter, manager of Boston-Maine Airways. There are fourteen members enrolled. The club will need a membership of twenty in order to carry out their plans for purchasing a plane.

BOSTON-MAINE AIRWAYS carried 1,500 passengers in their first month of operations between Boston, Portland and Bangor. Eighty per cent of their schedules were completed and it was necessary to add another plane a day between Portland and Boston where the heaviest traffic occurred.

## Stamford Gliding Club

THE Stamford Gliding Club, Stamford, Conn., recently test-hopped its first ship, constructed by club members. The first glider club to be formed in the State of Connecticut, it has an initial membership of fifteen members. The purchase of a second glider will be made very shortly. A ground course is given at the meetings, and flight instruction is by the auto-tow method, under the direction of W. C. Garey, J. Rourke and F. R. Ashley, the latter formerly of the Berkeley Aero Club, and the Ferron Glider School, of Berkeley, Calif. Meetings are held every Wednesday evening in the V. M. C. A.

# Air Progress Pageant Held

AN AERIAL pageant depicting the progress of aviation during the years between 1910 and 1931 was held at Glenn H. Curtiss Airport, North Beach, Queens, N., September 20. Under the auspices of the Chamber of Commerce of Queens, an aviation committee led by Alfred Warwick, chairman, and assisted by Robert Wessman, George Sutherland, Eugene Sullivan, Frank O'Hara, Thomas Malone and A. E. McDougal, had charge of the arrangements.

Planes flown included the 1910 Curtiss Pusher; the 1931 Curtiss-Wright "Junior," a group of wartime battle planes consisting of the Fokker D-7, Thomas Morse Scout and the British SE-5; the first cabin plane built by Guiseppe Bellanca; several modern Army and Navy planes; and an autogiro.

THE first of state departments in New

York State other than the State Police to use an airplane, the Conservation Department recently purchased a three-place open-cockpit Fleet biplane for use mainly in forest fire patrol and observation work. The department supervises the state forests, of which there are more than 2,000,000 acres in the Adirondack and Catskill Forest Preserves, and other wooded sections.

Albert L. Leo-Wolf, who has been engaged as the regular airplane pilot of the department, is the first civilian pilot to be employed by the State of New York.

THE appointment of three outstanding men to its staff of special lecturers and the institution of three new courses in aeronautical and radio law was recently announced by Dean Frank H. Sommer of the New York University School of Law as part of the school's program of cooperation with the American Academy of Air Law.

The new additions to the staff of special lecturers for the year beginning in September, include Henry G. Hotchkiss, Arnold Knauth and Bethuel M. Webster, Jr.

A NUMBER of courses in aviation and radio communication for pilots and ground school teachers is being conducted at New York University, beginning September 22. Evening engineering courses have also been included in the curriculum, including a practical aviation engineering course designed to prepare men for air transport work, production of aircraft and executive work at the factory or airport.

GENERAL AVIATION CORPORA-TION, New York City, has announced the change of name of its subsidiary, the Fokker Aircraft Corporation of America, to the General Aviation Manufacturing Corporation.

GIROFLYERS, LTD., recently took over operations of the Poughkeepsie, N. Y., Airport from the Lent Airways, Inc. Field operations are now under the direction of Lieut. John M. Miller. C. B. McMullen, formerly of the Red Wing Flying Service, is operations manager of Giroflyers, Ltd.

# Jaeger Jump Hour Clock

THE Jaeger Watch Company, Inc., New York, recently announced the addition to their line of a new eight-day timepiece known as the "Jump Hour" Clock. This timepiece indicates elapsed



Jaeger "Jump Hour" clock

time in hours and minutes without the necessity of computation.

The Jump Hour Clock is available in either a dull nickel or chromium case, set off by a silver rippled dial. The case is designed for easy installation of the clock in a convenient position.

A THREE-DAY air meet was held at the airport, Schenectady, N. Y., September 24-26 in conjunction with the Centennial Anniversary of the DeWitt Clinton train run between Albany and Schenectady, September 24, 1831.

#### P. A. C. C. to Build Clubhouse

THE Philadelphia Aviation Country Club is about to start the construction of a club-house at Wingsport, Five Points, Pa., according to a recent announcement of members of the club. It is planned to have the building completed after the first of the year. The directors have approved the lease of Wingsport for the use of the club and the membership has authorized its execution. The clubhouse is sixteen miles from City Hall in Philadelphia. The field is comprised of more than 135 flat acres of land, drained and with easy air approaches from all directions.

The clubhouse will be of early American farmhouse type with a living room, open freplaces and dining room on the first floor; private bedrooms and baths above for members and guests; and lockers and showers in the basement. A stone paved terrace on the east side of the clubhouse will command a view of Whitemarsh Valley and of the flying activities at the field.

#### Legion Air Meet

THE second annual air meet to be conducted by the George H. Imhof Post of the American Legion was held recently at the Philadelphia Airport, Pa.

Major General Smedley D. Butler was honorary chairman of the meet, and Mayor Mackey, advisory chairman, with Edmund T. Hoche and Norman S. Gotwals assisting. Lieutenant C. F. Schilt of the U. S. Marine Corps headed the contest committee.

Military maneuvers, autogiro slow-speed races, stunting, and a diversified program of events attracted thousands of visitors,

PHILADELPHIA'S bid for restoration of the air mail stop at a local airport was officially presented during the recent visit of Assistant Postmaster General Glover to the site of the Philadelphia Airport.

Mayor Mackey stated that the tract had been improved to permit its use by airplanes in all sorts of weather. He contended that with the establishment of a new postoffice which will be closer to the airport, Hog Island would be the logical stop for air mail planes.

THE Frank & Seder Department Store, Philadelphia, Pa., recently inaugurated a model airplane club. Providing the success of the junior club warrants it, a senior club for young men and young women interested in aviation may be formed.

CONSTRUCTION of the first of a new series of individual hangars at Wingsport has been completed. The first series, comprising nine hangars, has been occupied. It has been found that additional space will be necessary to provide adequate storage.

THE Wings Corporation recently acquired an enclosed Waco glider for student training. The ship, a one-place job, may be powered with a small Jacobs engine if de-

WITH \$2,000,000 in undelivered orders on its books, the plant of the Glenn L. Martin Company, aircraft manufacturers of Baltimore, Md., is exceedingly busy, particularly in the operations department. For the past few weeks the concern has been making deliveries of three planes a week. This plan is expected to be continued until completion of present contracts calling for twenty-five planes.

KREIDER - REISNER AIRCRAFT COMPANY, Hagerstown, Md., recently reported a substantial increase in scheduled production on the new Fairchild 22. Operators ordering planes and appointed as Fairchild dealers recently include: Descomb Flying Service, Hartford, Conn.; E. W. Wiggins Airways, Hillsgrove, R. I.; Lynchburg Flying Service, Lynchburg, Va.; Dixie Flying Service, Charlottesville, Va.; Framingham Flying Service, Framingham, Mass.; United Air Services, Floyd Bennett Field, Brooklyn, N. Y.; and East Coast Flying Service, Allenhurst, N. J.

THE Robey-Lambert Diesel Company, formerly the Robey-Lambert Airplane Company, maintains a laboratory at Washington, D. C., for building and testing highspeed, full-Diesel, two-cycle engines of various types for aviation, automotive and marine purposes, according to E. B. Robey. These engines are built under patents granted recently, with the hope of manufacturing some time in the near future, any and all types that successfully undergo tests. The company is in no sense an airplane company and will concentrate activities in the engine field.

# State Air Officials Form National Organization

ORGANIZATION of the National Association of State Aviation Officials, intended to bring cooperation in aviation problems among all states, was effected at a meeting held in Cleveland September 2, attended by representatives of sixteen states.

Frank M. McKee, State Director of Aeronautics in Ohio, was elected the first presi-Reed Landis, chairman of the Illinois Aviation Commission, was elected vice president, and H. C. Bennett, New York, secretary-treasurer. George B. Logan, St. Louis, chairman of the aviation committee of the American Bar Association, was named counsel. The first board of directors is to consist of seven members to be appointed by the president, one man to be selected from each of seven districts into which the country has been divided. Successors to these directors will be elected by

representatives from the states in the districts they represent. The president also is to appoint a committee to draft a constitution and bylaws.

The organization is a result of a two-day conference called by Governor George White of Ohio. The principal purpose is to promote complete cooperation among the states, with the Federal Government and the industry in general. The organization will inaugurate a movement to have all states create a bureau of aeronautics. States represented at the meeting were California, Connecticut, Illinois, Maine, Maryland, Massachusetts, Michigan, New Jersey, Missouri, North Dakota, Ohio, Oklahoma, Pennsylvania, Tennessee, Virginia and West Virginia

State to Buy Plane
THE Ohio State Control Board has authorized Adjt. Gen. Frank D. Henderson to receive bids on a plane for the use of his department and to be at the disposal of Governor White and Director of Aeronautics McKee. The board allowed \$5,000 for a plane and \$875,50 for its maintenance until January 1.

BIDS for the construction of a new administration building, two hangars and a central heating plant at Patterson Field, Dayton, Ohio, will be sought by the War Department within the next few weeks. The total outlay will be about \$300,000.

# COLUMBUS

W. DONALD WALTER

NORTON FIELD, OHIO, has received a Curtiss 01 Falcon for the use of the Air Corps Reserve. The ship was ferried in by Lieutenant McConnell from Middletown Air Depot. This is the first airplane of this particular type that has been assigned to this station; we at one time had an 0-11 Falcon, but we have not previously had any plane powered by a D-12 engine. Lieutenant Mc-Connell expects to return to Middletown in the near future to ferry back another 02H for Norton Field.

AT this writing it appears probable that the City of Columbus, Ohio, and the War Department will carry through negotiations for the removal of the Air Reserve unit to Port Columbus. The municipal hangar has no tenant at the present time, and this modern hangar would be an excellent base for the Air Corps ships. Such an arrangement would have the further advantage of concentrating the major air activities of this city at one point, Port Columbus. Major William F. Centner, Commanding Officer of the 308th Observation Squadron, Air Reserve, and superintendent of Port Columbus, has been authorized by City Council to conduct the negotiations with the War Department.

LOCAL Air Corps Reserve officers ordered to the first training camp for this Corps Area, at Selfridge Field, Mich., include Captain Phil L. Williams and Lieutenants Roscoe C. Aukerman and Albert E. Harter. Major Centner attended the second camp, and Lieutenant Walter was ordered to active duty at Fort Sheridan, Ill., for duty with the anti-aircraft unit at that station.

IT IS interesting to note the growth of air traffic at Port Columbus during the past year. There are now thirteen scheduled ships arriving and departing each day. Some of these are mail planes exclusively, but the majority carry both mail and passengers. Four ships arrive and four depart during the night. In addition to these, T & W A operate a ship carrying freight only, which usually arrives sometime during the night.

# SOUTHEAST

Landing Field at Endless Caverns

AN AIRPLANE landing field has been completed and is ready for use on the Endless Caverns farm adjacent to Valley Pike, about fifteen miles north of Harrisonburg. Va., according to a recent announcement of Col. E. T. Brown, president of the Endless Caverns Corporation. He stated that the field may be used safely by planes carrying passengers and that airport engineers have inspected the field and found it adequate. No shops and hangars will be provided until warranted by sufficient demand. The landing field's area is approximately 2,600 feet by 500 feet with an "L" at one end to give an effective cross-distance of more than 1.300 feet.

THE Anderson Bros. Consolidated Co.'s Inc., Danville, Va., manufacturers of flying suits and uniforms, recently announced a new flying suit for winter wear at economical cost. It is especially intended for pilots and flying students.

One of the members of the concern, an experienced pilot who knows the value of comfortable flying equipment, selected this design as the smartest and most practical for cold weather flying.

PERMITS must be obtained from the United States Department of Commerce by unlicensed pilots to operate from Candler Field, Atlanta, Ga., according to the city ordinance regulating air traffic approved by Mayor Key September 10. Two weeks were allowed for them to move the base of their operations.

I. H. WENTWORTH, president of All-American Airways, Inc., recently reported the purchase of a new Aeronca training plane for use at the flying school. More than fifty pupils have enrolled for training.

#### Dedicate Roderick Field

RODERICK FIELD, the new 175-acre airport at Okeechobee, Fla., was dedicated September 13. All-American Airways will operate the field and conduct a training school, according to J. H. Wentworth, president. Paul Walker of Okeechobee was named field manager.

The airport was named in honor of C. W. Roderick, veteran mail flier and former Army pilot.

RECENT incorporations of aviation companies in Florida include the following: Aviation, Inc., St. Petersburg, Fla., to operate airships, twenty-five shares no par value, R. MacDonald, C. Ruby and W. A. Barwick, directors; and Quincy Airport, Inc., Quincy, Fla., to operate airplanes, \$5-00 divided into 1,000 shares par value \$5 each, P. C. Davis, A. C. Corray and K. A. MacGowan, directors.

CONVERSION of the municipal airport at Clearwater, Fla., into a commercial field, under the management of B. C. Skinner, was voted in the affirmative by the city commission recently.

THE new passenger and mail line linking New Orleans, Tampa, Pensacola and Havana has fixed a preliminary budget of \$100,000 for beginning operations. Three amphibion planes will be used. Contracts with the Frisco Railroad System for the sale of combination rail and airplane tickets along the line by way of Tampa to Havana have been made.

The fifty-acre emergency landing field at Stuart, Fla., was to be finished about October 1. A 212,000,000-candlepower polar ray beacon has been installed. A runway of 2,800 feet and one of 1,900 feet will be sodded with Bermuda grass.

# NORTH CENTRAL

FROM September 1 to December 31, 1929, the Kohler Aviation Corporation, which had opened an airline across the lake to Grand Rapids, Mich., completed 46,077 miles of flying. In 1930, Kohler planes flew 180,652 miles. Up to and including August 31 of this year, 180,581 miles have been flown.

According to F. W. Kohler, vice president, the number of passengers carried increased from 564 in 1929 to 2,881 in 1930 and to 3,003 in 1931. Express carried increased from 1,003 pounds in 1929 to 94,324 in 1930, but dropped to 17,469 thus far in 1931. The number of trips increased from 382 in 1929 to 1,488 in 1930 and 1,543 in 1931.

The company celebrated on September 1 the second anniversary of the line.

TWELVE steel hangars will be constructed at the Milwaukee County Airport at a cost of approximately \$7,500. The hangars will be rented to private individuals.

EDWARD HEDEEN, who has had charge of sales of the Waco planes in Racine and Kenosha Counties, Wis., has been named distributor for the State of Wisconsin.

TWO out of every three winners of events at the recent Cleveland National Air Races were uses of Haskelite, according to a recent report issued by the Haskelite Manufacturing Corporation, Chicago, III. Eighty-five per cent of the American record holders are Haskelite users, the report states, and eighty-five per cent of the aircraft manufacturers in America use

this product. Haskelite is a blood albumin glued plywood for aircraft use.

# Cut Magnesium Metal Cost

REDUCED prices on magnesium metal have been announced by the Dow Chemical Company of Midland, Mich. The new prices are thirty cents per pound in carload lots and thirty-two cents per pound in less than carload lots. This last reduction follows a period of sixteen years of successful manufacturing experience of this metal by the company. During this time, by means of process refinements through extensive research, production costs have been consistently reduced.

THE Muskegon County Air Show was held on the Muskegon County Airport at Muskegon, Mich., September 19.

Prizes amounting to \$375 and trophies were competed for and free gasoline and oil, as well as a banquet, were extended to the pilots. The banquet given at the Muskegon Country Club was sponsored by the local chapter of the N. A. A.

## Dedicate Council Bluffs Airport

THE Council Bluffs, Iowa, Municipal Airport was dedicated September 19-20. Ceremonies included the Trans-Mississippi Air Races underwritten by business men of the city and sponsored by the Council Bluffs post of the American Legion. A total of \$2,000 in prizes was posted for award to winners of the various contests.

The airport comprises a lighted, turfted area of 200 acres with a hangar and restaurant on the field. The field is two miles south of the city.

THE 1931 fall classes of the Edgewater Flying Club, Chicago, Ill., scheduled to begin on October 5, inaugurate the third year of the coöperative air college maintained by the club on a non-profit basis, officials recently announced.

Improvements made this year include the addition of 5,000 square feet of floor space, installation of new equipment and the acquisition of new instructors.

Giving complete ground and flight instruction at cost to members, the club maintains field activities at the Chicago Municipal Airport and the college and general offices in the Chicago business district.

# SOUTH CENTRAL

Legion Stages Air Show

THE Lambert-St Louis Field Post of the American Legion sponsored a flying program at the municipal airport on September 20.

The events included military maneuvers by pilots and planes of the 35th Division Air Service and the Naval Reserve Aviation Unit, both stationed at the field. Mrs. Mae Haizlip and her husband, Jimmie, demonstrated the ships they flew in the National Air Races, and Miss B. Smith made a high-altitude parachute jump. Admission to the general public was free.

IN ORDER to prevent a lighting failure at an inopportune moment, a dual power source is being installed at Lambert-St. Louis Field. The auxiliary power intake, installed underground, costs \$12,000, which is being divided between the city and the concern furnishing the electricity. The auxiliary circuit within fifteen seconds in the event of the failure of the main intake, costs \$2,500.

THE Monocoupe is now manufactured at Lambert-St. Louis Field in the factory formerly occupied by the Ryan Aircraft Company.

D. A. Luscombe, who designed the first Monocoupe in 1926, is in charge of the plant. He reports an average of several sales a week since moving to St. Louis.

#### St. Louis Aero Club

THE St. Louis Aero Club, St. Louis, Mo., has been formed by a group of prominent St. Louis aviation enthusiasts and pilots to promote good fellowship among pilots and those closely associated with the aviation industry and to render a friendly service to visiting pilots during their stay in St. Louis. Maj. James H. Doolittle, head of the aviation department of the Shell Petroleum Company in St. Louis, has been elected president of the club.

# Curtiss-Wright Production

DURING the first eight months of this year, the Curtiss-Wright Corporation built and sold 428 commercial airplanes, according to a statement recently issued by W. H. Beech, president of the Curtiss-Wright Airplane Company at Lambert-St. Louis Municipal Airport.

Of the 428 planes constructed and sold by all the Curtiss-Wright factories in the United States, more than 215 of them were manufactured at the St. Louis municipal airport.

More than 175 Curtiss-Wright "Junior" ships were constructed during this period, fitteen "Kingbird" planes were built and approximately twenty-five Curtiss-Wright "Scelans" successor to the Curtiss-Wright "Robin," were completed and sold. These figures are exclusive of seventy-four planes constructed and sold to the Curtiss-Wright Flying Service or other planes for use of officials of the corporation.

## Air-Rail Service

A FAST air-rail service from St. Louis to Florida points is available at St. Louis, the Consolidated Air Ticket Office has announced. Trains leave St. Louis at 3:05 o'clock every afternoon, reaching Atlanta at 8:20 the following morning. Trimotor planes of Eastern Air Transport leave Atlanta at 9:15 a. m., stopping at Jacksonville at 1:25 p.m., Daytona Beach at 2:30, St. Petersburg at 4:04 and Miami at 4:45 p. m.

# Plane Express Service

A NEW airplane express service between St. Louis, Memphis, Tenn., Jackson, Miss., and New Orleans has been announced by the Robertson Air Lines. All packages are called for and delivered by the Western Union Telegraph Company.

A reduction in passenger rates between St. Louis and southern points was announced by the company as follows: St. Louis to Memphis, \$13; Jackson, \$23, and New Orleans, \$31.50. The present schedule remains in effect, a plane leaving St. Louis daily at 11 a. m., and one arriving at 4 p. m.

FIVE YEARS of continuous operation were recently completed by the Von Hoffmann Air College at Lambert-St. Louis Municipal Airport, St. Louis, Mo.

One of the oldest aviation schools in the Middle West, the Von Hoffmann Air College maintains equipment and personnel for any type of aviation instruction. During the past five years, the school graduated 1,253 students, 865 of whom were ground students and 388, flight students. Students have flown a total of 17,660 hours or a total of 1,059,600 miles during the five years of operation. Plans for the expansion of all of its ground school courses to the full curriculum of the Army Air Corps schools are being completed.

# Light Plane Altitude Flight

AN unofficial altitude record for light airplanes with passenger was set at Oklahoma City, Oklah, August 16 by Mrs. Dorothy Pressler and Capt. Bill Bleakley, who attained an altitude of 16,090 feet, according to two altimeters carried in the

The barograph was sent to Washington, D. C., for calibration. The record of 15,100 feet was made by Miss Edna Rudolph and Thornton Wagoner at St. Louis in June.

The Oklahoma City fliers were in the air for two hours and fifty minutes, their gasonine supply giving out at the highest point after two hours and five minutes. They encountered snow storms and rain. A Cursis-Wright Junior was used on the flight.

A MEETING of the South Central airport section of the Aeronautical Chamber of Commerce was to be held in Tulsa, Okla, September 15-16. Charles W. Short, I.F., is section chairman. Sessions were scheduled at the Alvin Hotel. The section includes Colorado, New Mexico, Texas, Louisiana, Arkansas, Oklahoma, Kansas and the western half of Missouri. Of interest to airport managers, park board members and other city officials, the program included general airport management problems.

THE city of Texarkana, Ark., has voted an additional bond issue of \$20,000 to complete developments of its municipal airport.

AT Shreveport, La., a new airport is under construction by the Army Air Corps, to be known as Barksdale Field. Contract for lighting the airport was recently awarded to the Electric Construction Company of New Orleans for \$\$2,750.

NATCHEZ, MISS., plans the purchase of 100 acres to be developed into an airport.

LIEUT. HENRY BADHAM has been chosen head of the 106th Observation Squadron, Alabama National Guard, to succeed Major Sumpter Smith, who has been promoted to lieutenant-colonel in the 31st Division.

IT IS planned to erect a hangar at the airport, Huntsville, Ala., according to the Junior Chamber of Commerce.

THE Alabama Air Tour was to start September 14 with more than fifteen cities and towns on the route. A number of requests to have the tour visit other states were received.

THAT there is no business depression at Love Field, Dallas, Texas, is indicated by recent statistics compiled at the field.

Passengers to and from the field are expected to average 500 monthly for the entire year of 1931, as compared to 472 per month last year. More than sixty planes operate on and off the field daily; and 95,000 gallons of gas are consumed yearly at the field, transient planes using 20,000 gallons and airlines, 75,000 gallons.

Ground equipment located at the field is valued at \$800,000, of which \$500,000 is invested in buildings, \$250,000 in plant equipment and \$50,000 in spare parts. Value of flying equipment is placed at \$2,750,000.

More than 350 are regularly employed. Of these, 147 are mechanics employed by American Airways, Southern Division.

BLIND FLYING instruction is being given American Airways pilots during their scheduled day of rest between flights at Dallas, Texas.

THE name of the American Airways airport at El Paso, Texas, has been changed to Air Mail Field.

A \$10,000,000 building program, in progress for the last eighteen months at Randolph Field and other Army posts near San Antonio, Texas, is to be completed about January 1. Between 1,000 and 2,000 men were constantly employed and an

expenditure of \$8,000,000 was made at the largest project, Randolph Field.

Expenditures totaling more than \$2,000,-000 were made at Fort Sam Houston, Duncan field and Camp Normoyle.

A PROFIT of \$2,932.98 is shown for the first six months of the year at the Tyler, Texas, Municipal Airport, O. C. Palmer, manager, recently reported.

EAST Texas Air Transport, Inc., has been incorporated at Beaumont, Texas, with a capital stock of \$5,000. Beaumont Airport will be the headquarters of the new company, which will serve as Stinson agents.

A SHELL runways system costing \$21,000 has been completed at Houston Airport, Houston, Texas, municipal airport. The system includes three 1,800-foot runways and a connecting taxi strip.

THE Texas Aero Corporation has installed equipment in their new \$30,000 repair shop at the Fort Worth, Texas, Municipal Airport.

# SOUTHWEST

THE Aero Brokerage Service Company, Los Angeles Airport, Inglewood, Calif., recently reported the following airplane sales in a period of thirty days: Siemmens Spartan, to Bowman & Phelan, of Anthony, N. M.; Kinner Fleet, to Mr. Kirschner, of Oakland, Calif.; Wright Stinson Jr., to Mr. L. A. Sischo, of Los Banos, Calif.; Lambert Monocoupe, to Judge C. C. Catron, of Hobbs, N. M.; Schneider Special, to Mr. Garland Lincoln, of Los Angeles, Calif.; Cirrus Great Lakes, to Mr. S. J. Jaros, Fleet Air Base, San Diego, Calif.; Cirrus Great Lakes, to Mr. R. K. Buckle, Mill Valley, Calif.; OX-5 Waco, to Mr. H. D. Smith, Chula Vista, Calif., and Savoia Marchetti Amphibion to Mr. Monroe J. Sharp, Lakeport, Calif.

THE T. C. Ryan Flying School at San Diego, Calif., recently made further reduc-



Butler portable hangar packed for shipment by Butler Manufacturing Company

tions in all tuition rates, according to Earl D. Prudden, Ryan sales manager. It has been possible to cut rates in some instances to approximately one-half of what they were at the beginning of the year. Special features such as blind flying, an increased amount of cross-country training and trimotor instruction have been added to the transport courses.

ONE OF the most desolate and hottest portions of the United States—Death Valley—was surveyed from the air recently by the T. C. Ryan Aeronautical Company of San Diego, Calif., for the United States Department of the Interior. Extreme differences in elevation, ranging from 274 feet below sea level to 7,000 feet above, coupled with heat waves resulting from a varying heat of 120 degrees to 130 degrees Fahrenheit, produced a combination of hazards and problems seldom encountered in aerial photography.

Successful results were obtained by John Fornasero, Ryan chief pilot, who flew a Fairchild cabin plane on the survey, and P. A. McDonough, who handled the special Hugershoff camera.

ELLIOT & Duck Flying Service of Oakland Municipal Airport has inaugurated a week-end service for sport fishermen, that is proving popular. Planes fly the anglers from the Oakland airport to the new sportsmen's flying field at the mouth of the Klamath River, near the Oregon line. Excellent fishing is to be had near the 2,500-foot runway. Overnight accommodations are but a short distance away. The return flight, requiring some two hours and thirty minutes, is made at sunup Monday.

## Oakland Air Traffic

A TOTAL of 2,961 persons took to the air from Oakland Municipal Airport during the month of August, according to the official report of the Board of Port Commissioners. Of this number 844 were carried by transport planes.

Landings for the month totaled 7,439, of which 4,988 were made by training planes. The total number of students taking instruction at the field was given as 387.

EXTENSION of Bidwell Airport, Red Bluff, Calif., to an "L" field which permits landing from any direction has been announced by the management. Runways are 2,800 (feet and 2,000 feet in length. The field is situated on the beacon route to Seattle, Wash.

Facilities at the airport include flood lights, boundary lights and twenty-four-hour service. The field is owned by the City of Red Bluff.

THE Boeing School of Aeronautics, Oakland, Calif., recently reported that the following companies have employed master mechanic graduates of the school during the past few weeks: Heath Airplane Company, Niles, Mich., one; Varney Air Lines, Portland, Ore, one; Boeing Air Transport, Cheyenne, Wyoming, two; Century Air Lines, Chicago, Ill., one; Chance Vought Corporation, Hartford, Conn., two; Boeing

System, communications department, Oak-

CHIEF of Police Vern Smith of Alameda, Calif., has established a special bureau for enforcing state and local air laws in coöperation with the Federal authorities. D. C. Warren of San Francisco Bay dirdrome has been placed in charge of the work

FOR the purpose of eliminating fire hazards, Hangar No. 1 at Mills Field, San Francisco, has been reconstructed and heavy firewalls installed in the structure. The cost was estimated at \$15,000.

ELEVEN high school instructors from half a dozen Western states recently completed a special summer course in aeronautics at the Boeing School of Aeronautics at Oakland Municipal Airport.

SETTING a new record for the field, a total of 3,962 landings was registered at San Francisco Bay Airdrome in Alameda during August. Passengers totaled 8,926, of which 6,500 were carried by transport planes. Air Ferries, Ltd.; transported 2,000 passengers on the transbay service.

# CONTACTS

By F. E. Samuels

Los Angeles Air Races
THERE were between 80,000 and 100,000
spectators each day at the Los Angeles
Fiesta Air Races, held at Los Angeles
Municipal Airport, Los Angeles, Calif.,

September 12-13.

Among the prominent features on the program were the Navy Hell Divers, the Busy Buzzards (Frank Clarke, Roy Miner and Roy Wilson), Battle Squadron V56 from the Saraloga, Dick Myhres in his

primary training plane hopping the hurdles, and the three ground cycle planes maneuvering about the field for the entertainment of the crowd.

On the first day John Hinchey in his Warner-powered Monocoupe finished either first or second in every race in which he was entered

GLADYS O'DONNELL defeated half a dozen men pilots in one of the races, setting the top race speed of the meet—169 miles per hour. Miss Jean Allen won the women's race in handy style.

The following are the complete results of the two races:

September 12

One-mile dash, 350 cubic inches or less— Won by John Hinchey, 153.85 m.p.h.; Robert Weil, second, 152.55 m.p.h.; Don Cardiff, third, 125.25 m.p.h.

One-mile dash, 650 cubic inches or less— Won by K. Neese.

One-mile dash, 1,000 cubic inches or less
—Won by Gladys O'Donnell at 169 m.p.h.;
John Hinchey, second; Robert Weil, third.

Twenty-five-mile dash, 175 cubic inches or less—Won by John Hinchey, 19 minutes, 45 seconds; Ralph Davis, second, 20 minutes one second.

Twenty-five-mile dash, 650 cubic inches or less-Won by John Hinchey.

Twenty-five-mile dash, women only— Won by Jean Allen; Gladys O'Donnell, second; Bobbie Trout, third.

Twenty-five mile dash, 650 cubic inches or less—Won by Roy Miner; John Hinchey, second; J. S. Wakefield, third.

September 13

Special twenty-five-mile dash for women pilots, flying Kinner K-5 100-horsepower Fleets—Won by Jean Allen, 111.60 m. p. h.; Yolanda Spirito, second; Bobbie Trout, third.

# ALEXANDER "FLYABOUT" CABIN PLANE

about" two-place light cabin monoplane are in quantity production in the Alexander Eaglerock factory, Colorado Springs, Colorado, under two Approved Type Certificates from the Department of Commerce, the Alexander company has announced.

One model is powered with a thirty-eight horsepower Continental A-40 engine; the other is equipped with a forty-five-horsepower Szekely engine. Standard equipment includes dual controls, cabin heater and Goodyear Airwheels. The Continental model has been flown over Pikes Peak at 15,000 feet and 3,000 miles on a "bug hunting" tour by the chief engineer. A Szekely job was flown 3,500 miles to the National Air Races and back to Colorado Springs on a demonstration tour.

The Flyabouts were designed to have "hands-off" stability and a slow landing speed for sports and student flying. Fuel costs for an hour's flying run less than one dollar an hour, according to the company. The Continental model does thirty miles to a gallon of gasoline.

The Continental model carries A.T.C. 439, the Szekely Flyabout, A.T.C. 449.

Model D-2, powered with the Szekely engine, utilizes the M-6 airfoil. The wings are constructed of solid spruce spars and wood truss ribs, covered with fabric. The fuselage has a framework of torch welded seamless steel tubing, fabric covered. The landing gear is of the split-axle type. The Szekely powerplant is rated at forty-five horsepower at 1,750 revolutions per minute.

# Specifications

#### Model D-2 (Szekely engine)

| Span             |     |      |          |         |
|------------------|-----|------|----------|---------|
| Height overall   |     |      |          |         |
| Length overall   |     | 21 f | eet 8.5  | inches  |
| Wing area        |     | 17   | '5 squa  | re feet |
| Weight empty     |     |      | 582 1    | ounds   |
| Useful load      |     |      | 389 1    | ounds   |
| Payload          |     |      |          |         |
| Gross weight loa | ded |      | 962 g    | ounds   |
| Wing loading     |     |      |          |         |
| Power loading    |     | 2    | 1 lbs. p | er h.p. |
| Fuel capacity    |     |      |          |         |
| Oil capacity     |     |      | 1        | gallon  |

# Performance

| High speed93 miles          | s per hour |
|-----------------------------|------------|
| Cruising speed80 mile       |            |
| Landing speed28 mile        |            |
| Climb (sea level)750 feet p |            |
| Service ceiling             |            |
| Absolute ceiling            |            |
| Cruicing radius             | 150 miles  |

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National Guard Race, twenty-five miles— Won by Capt. E. H. Robinson; Lieut. J. Wallen, second; Lieut. Paul Whittier, third; Lieut. J. W. Sewell, fourth.

Women's free-for-all, twenty-five miles— Won by Gladys O'Donnell; Bobbie Trout, second: Clema Granger, third.

Men's Race, twenty-five miles—Won by Bob Weil, 132.33 m.p.h.; Don Cardiff, second.

Men's Race, fifty miles—Won by R. O. Clampitt, 191.49 m.p.h.

Fiesta Derby, fifty miles—Won by R. O. Clampitt, 183.25 m.p.h.; Roscoe Turner, second; Lloyd O'Donnell, third; John Hinchey, fourth.

# NORTHWEST

A NEW airport administration building is planned for early construction at Felts Field, Spokane, Wash. Other improvements include the establishment of a radio beacon construction program, which has been placed in charge of L. N. Hart of Seattle, construction of new hangars as the airport expands and an administration building, to be erected east of the present row of hangars.

WASHINGTON'S newest airport is that on Lopez Island, near Richardson, Wash. Dedication with aid of Seattle pilots is to take place soon. The Lopez Island Commercial Club developed the field.

A FALL and spring program of improvement is being inaugurated at the Walla Walla, Wash, airport. The city expects to construct a large hangar this autumn, and will develop-new runways with the coming of spring.

# TRADE LITERATURE

NEW PAMPHLETS AND BOOKS OF INTEREST TO THE AERONAUTICAL INDUSTRY

# Alco Lava

CATALOG 32, describing Alco Lava and Magnesia, has been announced by the American Lava Corporation, Chattanooga, Tenn. Lava insulating parts, made by the company for a number of electrical and mechanical uses, are designed for high temperature work in a number of shapes to serve a variety of demands. There are no standard forms which can be catalogued or priced. everything being made up according to the requirements of apparatus manufacturers. However, a number of uses to which electrical manufacturers are putting lava are illustrated. Magnesium oxide developed particularly for the use of the vacuum tube trade is described.

# NEW AERONAUTICAL BOOKS

#### AROUND THE WORLD IN 8 DAYS

By WILEY POST and HAROLD GATTY

D OST and Gatty tell of their flight around

the Northern Hemisphere in eight days, fifteen hours and thirty-one minutes. They describe preparations, equipment and method of actual flight. While the book is essentially a narrative rather than an exposition, it provides the reader a scientific insight into the problems of navigating and flying a long and difficult air route.

There is a considerable amount of intimate detail. Each filer alternates with the other to tell of his thoughts, emotions and particular problems as they made preparations, started, flew the Atlantic, crossed Siberia and the northern route to Alaska, then Canada and the Northern United States to Cleveland and New York. In addition, Post and Gatty tell of their earlier lives.

There is a number of photographs, an introduction by Will Rogers, and an exact reproduction of the pages of the actual log book carried on the Winnie Mae, showing hour-to-hour entries just as Gatty made them.

# THE PROBLEMS OF VERTICAL FLIGHT

By Parlee C. Grose

WERTICAL flight is regarded by the author as a new and infant art which is beset with a multitude of development problems incident to a maturity yet to be attained. This book has been prepared to contribute "whatever it may possess of organized and regimented facts and data to the extant literature of vertical flight." The word "helicopter" as used in this work connotes any of a general class of aircraft designed primarily for vertical flight.

The development of this phase of aeronautic study is reviewed from the first crude experiments and theories to the present time. The value of the helicopter in view of the ever increasing development of the conventional airplane, the feasibility of the helicopter idea and the requirements of the helicopter are discussed. The contents in-

# Heston Air Park

"ABOUT HESTON," a booklet describing Heston Air Park, Hounslow, Middlesex,
near London, England, was recently published by Airwork Limited. There is a
number of articles reprinted from various
publications and depicting the field from different points of view. The history and purpose of the airport are discussed and the
facilities available at the field are described.
There is a number of photographs illustrating the design and construction of the
field and of the various airrort buildines.

## South Bend Lathes

THE South Bend Lathe Works, South Bend, Indiana, recently issued a new general catalog, No. 92. This 128-page catalog, in two colors, contains illustrations, descriptions and prices of the South Bend Series "O" clude the following chapters: Problems of ascent, descent, translation and stability, the rotating wing as a lifting airscrew, the magnus effect and the rotor and the rocket principle. Helicopters are classified as to types.

# THE BOOK OF GLIDERS By EDWIN WAY TEALE

T HE results of several years' work in collecting material are represented in this volume, which is intended as a complete glider manual. Mr. Teale tells how to build and fly a glider, how to qualify for a pilot's license, and how to organize a glider club. He goes into minute detail on the construction of motorless aircraft and reviews the history and development of motorless flight. A preface by W. Hawley Bowlus is included. The text is illustrated with photographs and diagrams.

# THE COMPLETE AIRMAN By CAPT. C. C. BAILEY.

I NTENDED primarily for pilots or prospective pilots, this book covers information on construction and maintenance of aircraft and aircraft powerplants, in addition to flying instructions generally. The following chapters are selected at random to illustrate the scope and aim of this work:

Mechanics, Theory of Flight, The Aeroplane, Materials of Construction, The Control System, The Propeller, The Aero Engine, Engine Starting and Running, Engine Faults, The Care of Engines, Instruments, Rigging, Flying Instruction, Aerial Maneuvers, Practical Flying, Aerial Navigation, Inspection, The Effects of Altitude and The Weather.

# THE RIGHT TO SOLO

Edited by RAMON WILKIE KESSLER

T HIS volume represents a collection of airplane stories of interest to older boys and girls. An anthology of modern adventures in the air, the book is devoted to romantic and adventurous aerial exploits. Illustrations are by Clavton Knight.

line of lathes from nine-inch size to eighteen-inch size. Several new model lathes have been included in this edition. This new catalog, which contains the latest developments in the field along with much interesting information, is intended as a reference book for the purchasing agent and for the mechanic. It will be mailed anywhere, free of charge, upon request, according to the company.

## New England Airports

A BOOKLET listing and describing the airports and landing fields in New England was recently prepared by the Aviation Bureau of the Boston Chamber of Commerce. The booklet contains the results of a survey made by the bureau to meet the demand for concise and convenient information on the airplane landing facilities in this section of the United States.

# LATIN AMERICAN AVIATION

Mexico Largest Importer of American Aircraft Products in June

DETAILED information on aeronautical exports from the United States to Latin American countries during the month of June was recently announced by the Bureau of Foreign and Domestic Comerce, U. S. Department of Commerce.

Mexico was not only the largest buyer of American aeronautics products in Latin America during this period, but lead all other countries, purchasing nine airplanes at a total cost of \$189,895 and \$4,690 worth of parts. Chile was second among the Latin American buyers, with one airplane costing \$58,602 and \$15,847 worth of parts. Argentina was third, buying two airplanes with a total value of \$7,421 and parts with a total value of \$7,421 and parts with a total value of \$1,413. Guatemala bought one plane at \$2,400. One engine at \$6,035 and \$714 worth of parts were shipped to Porto Rico.

There were no other engine exports. Other Latin American countries, purchasing aeronautical parts exclusively, were as follows: Panama, \$5,355; British West Indies, \$1,153; Cuba, \$4,500; Brazili, \$4,027; Peru, \$1,153; Colombia, \$467; Bolivia, \$32, and Honduras, \$25

INCREASING SALE of American-built military and commercial aircraft in Central and South America was predicted recently by H. B. Pentland, aeronautics commissioner for Latin America of the Bureau of Foreign and Domestic Commerce. Discussing the potentialities of the Latin American aircraft market with officials of the Boeing Airplane Company, Seattle, Wash., Mr. Pentland said that in his opinion an increasingly large number of United States commercial and military planes would be sold to countries in Central and South America during the next few years. Stimulation of this market, it was stated by Mr. Pentland, is a principal aim of the Bureau.

# Panama Buys Curtiss Planes

THE Republic of Panama has announced the purchase of three planes from the Curtiss-Wright Export Corporation. The ships will be used in government work. The order comprised one Wright Whirlwind 300 Keystone Commuter and two Wright Whirlwind 240 Travel Air Speedwings.

The Keystone Commuter will be used for police work, as an emergency ambulance plane and to transport mail and freight. The two Travel Air Speedwings will be equipped with armament and employed for patrol work.

Captain Marco Gelabert, Chief of the Panama Air Force, will be in charge of the new airplane unit.

Mexico Encourages Foreign Air Tourists
THE department of aviation of the Ministry of Communications has recommended
that all possible conveniences be made available to tourists who come to Mexico by

airplane. The recommendation stated that airplane tourists comprise for the most part persons of means and a select group and for this reason no special vigilance over them is necessary. When it is established that the airplane passengers are tourists, permits to fly over Mexican soil should be expedited with the minimum of inconvenience and with the greatest possible speed, it was suggested.

THERE are fifty-one aircraft in Mexico owned by private fliers, according to official information recently made available by the Mexican Government. Thirty-eight of these ships are of American manufacture.

## Mexico-Lower California Air Service Inaugurated

MONTERREY. Mexico, is now connected to La Paz, Lower California, by air. Intermediate points are also served. The new service was inaugurated recently in accordance with the plan of Gen. Andreu Almazan, secretary of communications. Contracts have been signed, according to officials of the Cia. Aeronautica de Transportes, for the establishment of daily passenger service between La Paz and Mazatlan, Sin., where connections will be made with the line from Brownsville and Torreon and with Topolobampo, Son., and Culiacan, Sin., Chihuahua, Chih., Mexicali, Tiajuana and Ciudad Juarez. Passengers leaving Monterrey at 10:15 a.m. may leave Mazatlan at 3:30 p.m. and arrive at La Paz at 6 p.m. Other lines being studied, including the one from Monterrey to Mexico City and Monterrey to Tampico, will when completed make the Nuevo Leon capital a real air center, the routes radiating to all of the principal parts of the Republic as well as to the United States.

THE FIRST Colombian pilot to be employed by SCADTA is T. Forero, who received his training in the United States. Previous to his appointment, all of the pilots had been imported from other countries, no qualified native pilots being available.

# New Pan American Operations PAN AMERICAN GRACE AIRWAYS

I has obtained a concession from the Peruvian Government to establish its own radio stations and airports to facilitate communications between the company's planes in Peru and to obtain accurate reports on weather conditions, according to a recent unofficial announcement. The company operates the new Lima-Santiago service. During the first week of operations, radio operators of the new line maintained communication with the Santiago and Antofagasta wire-less stations and with the Pan American station at Para, Brazil, 2,500 miles distant.

It is expected that Pan American will inaugurate a Santiago-Buenos Aires-Montevideo service within a period of six weeks. Under recent agreements, Pan American is limited to carrying international passengers and mail over Chilean territory. However, it has been rumored that the Chilean national service may be abandoned because of cost, leaving the field open to the "American monopoly."

# SCADTA to Begin New Airline

THE SCADTA Company is preparing to imagurate air mail and passanger service between the port of Buenaventura on the Pacific Coast and the cities of Cali, Medellin and Puerto Berrio, in the interior. In order to reach Puerto Berrio from Medellin, the Andes must be flown over. The trip from the coast, which requires from three to four days by ordinary means of transportation, will be made by SCADTA planes in four hours. The distance is approximately 350 kilometers.

IN coöperation with the Colombian Government, the SCADTA Company plans to develop an airport at Puerto Lievano. This city, on the Magdalena River, is the terminal of the railroad from Bogota, capital of Colombia. Passengers flying from Barranquilla will then be able to stop at Puerto Lievano and connect with the railroad to Bogota and reach the capital the same day. The distance between Barranquilla and Puerto Lievano is 500 kilometers. By railroad from Puerto Lievano to Bogota requires five hours.

# Brazil's Department of Aeronautics

P OR the purpose of supervising civil and commercial aeronautics, the Department of Civil Aeronautics has been created by the Brazilian Government. Air mail revenues will be used to cover the expenses of the new aviation department.

The work of this body will be carried out under three divisions as follows: administrative, operations and traffic sections. Each section is composed of three members. The Air Minister, however, may appoint additional personnel. The departments of war and navy will maintain with the Department of Civil Aeronautics an aviation officer who will coöperate in the study of aviation problems.

Among the functions of the administrative section are the study of foreign and national air legislation and conventions; examination of the condition of companies seeking concessions or permits for air services; study of the rights ard obligations of pilots among themselves and in relation to owners and manufacturers of aircraft; and maintenance of relations with foreign administrators of civil and commercial aeronautics.

The operations section has under its jurisdiction the inspection, licensing and registry of aircraft; licensing civil pilots: study and opinion on the establishment of new airports; examination and report on the creation and operation of civil aviation schools and aircraft factories.

Among the duties of the traffic section are drawing up of plans and charts of commercial air communications; study of the establishment and operation of airlines; and granting of special licenses for execution of flights by Brazilian and foreign airplanes.



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# FOREIGN NEWS IN BRIEF

Compiled from reports from AERO DIGEST correspondents and the Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce.

# **ENGLAND**

England Retains Schneider Trophy— New Seaplane Records Established by British Pilots at Calshot

I NCHALLENGED by competition from another nation, Great Britain won permanent possession of the Schneider Trophy in a speed test conducted September 13 at Calshot, England. Flight Lieutenant I. H. Boothman flew a Supermarine S6-B seaplane around a 31.7-mile triangular course seven times at an average speed of 340.08 miles per hour, exceeding by more than eleven miles the average speed of the late Lieutenant H. R. D. Waghorn, winner of the last race in 1929. On the first two lans he broke the 100-kilometer (62.1-mile) record at an average speed of 342.9 miles per hour, exceeding the former record of 331.75 miles per hour.

Following the Schneider Trophy flight, Flight Lieutenant G. H. Stainforth established a new world's seaplane speed record of 379.05 miles per hour over a straightaway course of three kilometers (1.863 miles). flying a Supermarine S6-B seaplane. The fastest speed attained was 388.67 miles per hour. The record was made for the best four of six successive laps over the course. The previous record of 357.7 miles per hour was established in 1929 by Squadron Leader A. H. Orlebar.

France and Italy, expected to compete in the Schneider Trophy Race, withdrew a few days before the race. The British team then prepared to enter a plane and, complying with the rules of the contest, make an attempt to break all previous records. Lieutenant Boothman's flight constituted a new record and won for England the Schneider Trophy for the third successive time, bringing permanent possession of the cup. He covered the entire seven laps of the course in a total of thirty-eight minutes, 22.15 seconds.

The Schneider Trophy was presented by the late Jacques Schneider, French sportsman. The winning speed has increased from 117 to 340.08 miles per hour in the history of the contest. The United States was the winner in 1923 and 1925.

# Royal Aero Club Issues 10,000th Aviator's Certificate

THE Royal Aero Club recently announced the issuance of its 10,000th aviator's certificate. The club's certificate is the only recognized proof of proficiency that the private flier in England may obtain and he must possess it before the Air Ministry will grant the "A" license without which he may not pilot an airplane outside the immediate vicinity of an airport.

Thousands of war pilots obtained the certificate, increasing the register more than might otherwise have been possible. The list also includes a number of foreign fliers. However, the number of certificates is con-

sidered to evidence the growth of British flying during the past twenty years. Last year a total of 934 certificates was granted. The Royal Aero Club supervises the required test of every applicant.

THROUGH passenger transport service between London and Cape Town, South Africa, is scheduled to be inaugurated by Imperial Airways on January 1, 1932, Passengers will travel in five types of aircraft: from England across Europe in a Handley-Page "Hannibal," forty-two place biplane; across the Mediterranean in a Short Brothers "Kent" flying boat; from Cairo to Khartum in a Siddeley-Armstrong "Argosy"; from Khartum to Kisumu in a "Calcutta" flying boat; and from Kisumu to Cape Town in a DeHavilland "Hercules." A total of eight days will be required for the flight from London to the Cape.

The company has established airports at the following cities: Nairobi, Moshi, Kodoma, Mbeva, Mpika, Broken Hill, Salisbury, Bulawayo, Pietersburg, Germiston, Kimberley, Victoria West and Cape Town. At several of these stations, long and short wave radio apparatus has been installed for communication between stations and between stations and planes in flight.

# FRANCE

AS ONE of the first steps in the reorganization and modernization of the Aviation Corps, President Doumer recently signed a decree creating a Superior Air Council composed entirely of generals. The decree was presented by Air Minister J. L. Dumesnil at the Council of Ministers in the Elysee

#### Civil Planes in France

THERE WAS a total of 1,320 civil airplanes in operation in France on July 1 of this year, according to a recent unofficial but reliable census. This represents an increase of 327 over the 993 planes in civil use on July 1, 1930. Of the total number, 639 are owned by air transport companies, 290 by private companies and individuals, 241 by manufacturers for use in flying schools and company business, 107 by flying clubs and private flying schools and fortythree are used for miscellaneous purposes.

# French Air Force Maneuvers

THE most imposing maneuvers of the French Air Force since the World War were held recently to test France's aerial defense along the eastern frontier. New types of aircraft were tried out and giant "enemy" bombers were tested for data which the Air Ministry is collecting on bombing squadrons.

France's air defense supplements fortifications built along the frontier during the past ten years and is organized in conjunction with ground defenses.

In these maneuvers the civilian population was asked to cooperate by extinguishing all lights when given the signal during the maneuvers. A system of alarms has been arranged to permit the air commanders to check the time required to extinguish all lights after the first raiding craft is detected by means of amplifying "ears" of the air defense.

Two hundred planes of the French Air Force engaged in one phase of the maneuvers which comprised four days and nights of continuous fighting between "enemy" and defense planes.

# ITALY

# Deliver Do.X II to Italy

THE Do.X II, the first of two giant flying boats ordered from the Dornier Works by the Italian Government, was recently flown from Altenrhein, Switzerland, to Spezia, Italy, for delivery. The ship is approximately the same size and is built along the same lines as the Do.X, which recently completed at New York a flight from Altenrhein via South America.

The flight of the Do.X II, made from the Dornier hangar near Friedrichshafen, Germany, to the Italian naval harbor at Spezia, was accomplished in less than four hours. crossing the Alps en route at an altitude of 12,000 feet. The plane carried a crew of twelve and six passengers. Further flight tests will be conducted by the Germans before official acceptance of the plane by the Italian Government, Twelve Fiat engines are installed.

Italian Air Maneuvers Engage 894 Planes TOTAL of 894 aircraft participated

in extensive maneuvers of the Italian Air Force held recently in the vicinity of Spezia and Ancona, thus including both the Tyrrhenian and Adriatic coasts. With these exercises, Italy began for the first time experiments in the use of aviation as an independent unit not connected with either the army or the navy, employing the principle of the "mass use" of aircraft,

The main purpose of the maneuvers was to prove that the air can best be defended from the air. The exercises were both aggressive and defensive. Important tests were made in fighting in mass formation and mass defense. Day and night "attacks" were carried out on industrial centers, populous cities, naval bases, harbors, railway junctions and air bases.

Of the 894 planes employed, 288 were fighters, forty-eight for attack upon ground forces, twenty for strategic reconnaissance, 120 for day bombing, 128 for night bombing, and 153 for liaison. In addition, there were utilized thirteen experimental bombers, forty-eight fighting seaplanes and seventysix seaplane bombers.

# **GERMANY**

A LARGE number of German student corps and unions are joining the ranks of the German Aviation Union. Recently two new corporations with 3,000 and 5,000 members, respectively, joined and a large number of these students immediately subscribed for sail-plane and gliding instruction in several training camps of the union.

# NETHERLANDS

WEEKLY air mail service between Amsterdam and Batavia, Java, was to be inaugurated October 1 by the Royal Dutch Air Transportation Company, K.L.M., to replace the present fortnightly service. Two types of planes, the Fokker VIIb and XII, will be used. Passengers will be carried and rates have been announced by the company. Planes will leave Amsterdam every Thursday morning and Batavia every Friday morning.

# U. S. S. R.

THE FIRST Soviet thirty-two passenger monoplane, the ANT-14, was recently completed by the Central Aero-Hydro Dynamic Institute. This plane, designed by A. N. Tupolev, is made of special aluminum alloy and is powered with five engines of 480 horsepower each. Manufacture of the plane, which was constructed at the Kolchug plant, is scheduled to be organized on a production basis.

# **CHINA**

# Airport Facilities in China

THERE has been some progress shown in the development of airplane landing facilities in China, according to a report recently issued by Trade Commissioner Edward P. Howard at Shanghai.

In the Yangtze Valley there are seven provinces, each province having from two to eight airports, landing fields or seaplane bases. There are in this area fourteen completed airports, seven completed landing fields and one intermediate landing field, one partly completed seaplane base and two seaplane bases, one airport and two intermediate landing stations under construction-mediate landing stations under construction.

At all of the completed airports there are hangars, administrative buildings and radio stations. At Lunghua airport (Shanghai), partly completed, temporary hangars, a radio station, meteorological station, repair shops and an administrative building have been constructed; the landing field is in good condition.

In South China, seven airports have been completed; all but one equipped with hangars, radio stations, administration buildings and with landing areas in most cases in good condition. Eighteen landing fields are completed and fourteen under construction. In addition there are three completed seablane bases.

In North China, Manchuria and special territories, there are fifteen completed airports, one under construction, thirty-five completed landing fields and one completed seaplane base. One intermediate landing field is being built at Tientsin.

There is but one purely commercial airport in China, at Peitaiho in Hopei province; one has been proposed for Linsi. Four military airports located at Nanking, Shanghai, Kuikiang and Canton, four intermediate landing fields, one complete at Wuhu, and three under construction at Ichang, Shasi and Tienstein and a temporary floating station at Kiukiang are used by planes of the Chinese National Aviation Corporation.

Additional hangars and other equipment are to be installed at seven airports and landing fields.

AN ORDER for six "Moth" training biplanes and two "Puss Moth" cabin monoplanes from the DeHavilland company of England has been placed by the Chinese National Government which rules from Nanking, according to information recently made available. This order brings to approximately 100 the total of Moth light airplanes sold to China within the past three years. The planes will be delivered to the Chinese military airport at Changsha. The training planes will be employed in the instruction of Chinese military pilots and the cabin ships will be stationed for the use of government officials on urgent business about the country. Around Changsha the countryside is a lacework of intersecting rivers and it is expected that these planes will be equipped with seaplane floats for operation from the water.

WALLACE HARPER & COMPANY, LTD., has been granted exclusive sales rights for Arrow Sport airplanes in Southern China, according to a recent announcement of C. B. Pirie, general manager of the Arrow Aircraft & Motors Corporation, Lincoln, Neb., U. S. A. The Harper company is distributor for the Ford Motor Company in Southern China, and has main offices in Hongkong and Canton with fifteen sub-offices as a cattered throughout the southern half of the country.

Wallace Harper, managing director of the company, will take a course in flying instruction at the Arrow Flying School at Lincoln, and will study the construction, servicing and operation of Arrow Sport planes. He plans to take a Kinner-powered Arrow Pursuit back to China for commuting between the Canton and Hongkong offices and dealers, and as a demonstrator.

# **CANADA**

# Canadian Aviation Activities in 1931

J. Montagues

C ONSIDERABLE interest has been evidenced in aviation in Canada during the summer. Air meets were held at a number of cities with successful results. The Trans-Canada Air Pageant from coast to coast, one of the most ambitious projects in the history of Dominion aviation, was successfully carried out. There has been a steady increase in the number of pilots, aircraft and airports licensed and air mail

poundage is greater in comparison with last year.

During the second quarter of 1931, according to recent government reports, there was an increase of seventy-five in the number of pilots' licenses, thirty-seven in aircraft registrations and ten in the number of air-port licenses issued. Registrations at the end of this period showed 358 private pilot licenses in effect, 405 commercial pilot licenses, 385 air engineers, 487 aircraft and seventy-three airports.

Despite the fact that four air mail routes were canceled because of general economic conditions, air mail poundage showed as increase. In the first six months of this year, air mail carried on contract routes totaled 298,996 pounds, approximately two-thirds of the amount transported in the whole of 1930.

Membership in air clubs has increased this year. Government-sponsored flying clubs flew approximately 5,000 hours during the first six months in sixty-three planes. Thirty-three commercial and twelve private pilot licenses were obtained by club members.

CONSTRUCTION of the first glider ever built in New Brunswick was recently completed by L. A. Fletcher. Initial test flights were successfully conducted. The craft has a weight of 130 pounds and a wing span of sixteen feet six inches.

RUNWAYS of the Sydney, N. S., Airport have been lengthened from 2,000 feet to 4,000 feet, according to a recent announcement of the Cape Breton Flying Club.

THE short wave radio receiving set recently installed at the Saint John, N. B. Airport has been placed in operation.

THE Halifax, N. S., Airport has been officially opened. Dedicatory ceremonies were held in conjunction with the Trans-Canada Air Pageant.

A JUNKERS Ju. 52 has been ordered by Canadian Airways, Ltd. This ship, powered with an 800-horsepower Armstrong-Siddeley engine, will be used to transport heavy freight into the Hudson Bay district from points in Manitoba.

# Aviation Day at National Exhibition

A 450-MILE cross-country air derby and exhibition flying by military pilots featured the Aviation Day held September 8 at Toronto in conjunction with the Canadian National Exhibition. Thirty-one pilots participated in the derby. W. N. Miller placed first to win the prize of \$2,500 and W. Drury of the St. Catherines Flying Club won second place and the prize of \$1,500. The five leaders in the race finished within a period of ininety seconds after more than four hours of flying.

Military flying was demonstrated by planes of the R. C. A. F. Flight Commander R. Atcherley, R. A. F., gave an exhibition of "perverted" flying and Capt. J. Sanderson demonstrated inverted flight.



# AN AERODYNAMIC BALANCE

THERE is perhaps no experienced model airplane builder who has not thought of the possibilities of a small wind tunnel to aid him in his experimental work. This is but natural, for in full size airplane design, model builders know that wind tunnels are quite indispensible. Before any work is at-tempted on a large scale performance, data is usually checked with care, using small non-flying models placed in an air stream. The wind tunnels used for this work are great, expensive laboratories. Giant fans blast the air at speeds as high as 100 miles per hour. It flows smoothly through honeycomb passages and finally strikes the model, free from any turbulance or irregularities. Delicate instruments measure each minute force on the model with exacting precision, and from these measurements the airplane designer checks and rechecks his performance calculations. The process is slow and precise but through years of development it has proved of great value. The whole science of aerodynamics has been built on such research supplemented by full flight results. It is little wonder then that model builders aspire to work along similar lines with their tissue and balsa wood creations

At first thought it would seem that a model airplane wind tunnel would be far too complicated for the average builder to attempt. The measuring of small lift and drag forces on a delicate model wing would seem quite impossible. But, after all, this opinion may be based on the knowledge of the extreme accuracy used in the large tunnels. Perhaps we are losing sight of what we really wish to know about our models. Let us not forget that the Wright brothers laid their aerodynamic foundation for the first successful plane in a crudely built wind tunnel, using a gasoline engine-driven fan to furnish the air blast.

At any rate, one of our readers has, we might say, "dared" to construct a model wind tunnel. He is Henry Projansky of 643 Beach Street, Revere, Mass., an air-minded hijh school graduate, who aspires to study aerodynamics at Massachusetts Institute of Technology. But before going ahead with the details of the device let us turn to the general subject of aerodynamics.

R. E. DOWD

Aerodynamics simply means the science of moving air and its reactions on various forms. Perhaps we have never thought of aerodynamics in connection with anything but airplanes. To be sure, it is of first importance in airplane design, but how about the wind blowing around a tower, a chimney, or tall building? Indeed, how about the air flow around an automobile, a train, or even the lowly milk wagon rumbling along the street? All have their aerodynamics. This may seem far-fetched but it is, nevertheless, a fact because any body moving through the air has a resistance. This resistance varies with the velocity, the density of the air, and the size and shape of the body.

One of the first things to be done by early investigators of mechanical flight was to determine values in terms of pounds of resistance for bodies of certain sizes and shapes, moving at certain velocities. This research was carried further in order to obtain similar values relating to lifting power of various wing sections. Having the lifting power avarious angles of flight and the resistance as well, it soon became evident that certain wing sections were more efficient than others because they had more lift and less frag.

Our great pioneers, Lillienthal, Chanute, Langley, the Wright brothers and Eiffel, all contributed to this important fund of knowledge. This was the foundation of the science of aerodynamics, and the wind tunnel or its equivalent was the indispensible means of carrying on this research.

Model builders have drawn freely from these data but again and again have been disappointed with their results. A wing section of supposedly high-performance characteristics would be chosen, and in actual flight tests the model performance would be far less than a crudely curved or even flat section. There is but one explanation. Because of their low speeds model airplanes have their own aerodynamics—separate and distinct from the

high speed wind tunnel results. For example, the well known Clark Y wing section has been tested at several wind tunnel speeds, the lowest of which did not begin to approach the three to four mile per hour speeds found in flying models. The results were astonishing. The burble point alone, which is the point where the lift of a wing falls off abruptly because the air flow "burbles," was found to change from around sixteen degrees for the high speed down to about half that angle for lower speeds. Here we have a complete upset of our carefully derived data. The only possible conclusion is obvious. There is definite need for research in slow speed aerodynamics.

# The Coefficient

In all of the early research the problem confronting investigators was to establish coefficients for various forms in order to know the amount of lift or drag. It was an early realization that the air forces varied as the square of the velocity. That is, the resistance of a body, for example, moving twenty miles per hour would be four times the amount for a body moving ten miles per hour. The reason is apparent. Twice as many air particles strike a body in a given time and the impact force is twice as great. This took care of one factor, the velocity.

Early experiments further established the fact that within limits the air forces on similar bodies varied directly as the area. In this case the projected area only is considered. This took care of another factor, the size.

It was soon discovered that the shape of a body had much to do with its resistance. A sphere, for example, offered less resistance than a disc of the same diameter. There was need for another factor. This was a coefficient, often referred to as  $K_L$  (coefficient of lift) or  $K_D$  coefficient of drag).

We are now ready for the basic formula  $R = KxAxV^2$  in which R is resistance in pounds. K is the coefficient. A is the area in square feet and V is the velocity in miles per hour. For the coefficients we must refer to the diagram, showing some of the more common shapes. These coefficients are, of course, for the higher air speeds. In all probability they would be different for velocations.

ities from three to ten miles per hour. Perhaps they would hold the same relationships but simply be increased or decreased. It is intriguing to speculate on what might be the discoveries attending such an investigation. Here lies a great unexplored field for research. Who will make aerodynamic history by being a true pioneer in this field?

To return to the Projansky balance, it can scarcely be expected that actual quantitative results can be obtained. It was not designed for that purpose. It was designed to demonstrate the lift and drag forces on small wings and to make comparisons between different wings. This it can do effectively, and by presenting the details of its construction in our columns we hope some of our readers may be encouraged to build more elaborate devices.

Without being too critical, it might be pointed out that discrepancies might result from the following sources. First, the air stream doubtlessly lacks uniformity and parallelism; second, the inclined surfaces of the frames might lead of labe lift readings; third, the rubber used to resist the air forces would age rapidly and also change from day to day because of temperature; fourth, the position of the counter weight would doubtless upset readings if it became necessary to change its size materially. But, in spite of these limitations, the device is

quite clever and should have considerable utility.

#### Description of the Balance

The Projansky balance utilizes two rectangular, pin jointed frames, held in zero position by rubber strands. One of these frames is mounted on a supporting post, while the other is mounted on the end of the first frame. This permits movement of the test part both up and down and forward and backward without changing its incidence to the air stream. The amount of displacement of the test part might cause a slight change in the results by moving it to another section of the air stream, but the rubber tension could be increased to minimize this movement.

# The Base and Post

The base (1) of soft wood, about  $\frac{3}{4}$  inch thick by 6 inches wide and 12 inches long, will be found large enough to support the device firmly. The post (2) is  $\frac{3}{4} \times \frac{3}{4} \times 7$  inches. Three diagonal braces (3) serve to steady the post which is fastened to the base with a wood screw passing up through from the bottom.

The main frame is supported by a strip (5) about  $\frac{1}{2} \propto \frac{1}{2} \sqrt{k} \propto 3\frac{3}{k}$  inches which is spaced out from the post by blocks (7) notched for the strip (5). Pins (6) are used as fullerum points for the frame. Small brass washers and tubular brass bushings minimize friction

at all fulcrum points.

# The Main Frame (For Recording Lift)

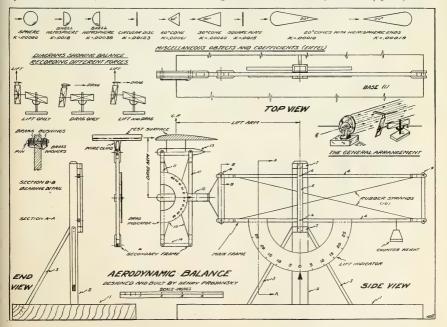
The upper and lower members (4) are  $\frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ 

# The Secondary Frame (For Recording Drag)

The long members of the secondary frame are (11). These pass through the slotted construction of the supporting piece (12). Forked construction on each end of the long members (11) mount the top and bottom pieces (13) and (14) respectively. Again rubber strands are used to stabilize the rectangular frame. The sizes of the members are approximately the same as the main frame.

# The Indicating Device

An arc-shaped piece of balsa or cardboard is used to indicate the movement of the frames in both cases. The numerals used have no significance. They (Continued on page 128)



Wright L.S



1931 Boeing Graduates include J. Eberly, A. Smith, C. Dunbar, Now Co-Pilots for United Air Lines.

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| Name                                                                                     | Age                                                                                                   |
| Address                                                                                  |                                                                                                       |
| . City                                                                                   | State                                                                                                 |

#### NATIONAL AIR RACE RESULTS

(Continued from page 39)

| September 4 and 5 (WITHOUT BRAKES)          |                  |              |            |  |  |  |  |
|---------------------------------------------|------------------|--------------|------------|--|--|--|--|
| Winston Krantz                              | Chicago, Ill.    | Aeronca      | Aeronca    |  |  |  |  |
| G. M. Johnson                               | Cleveland, O.    | Curtiss Jr.  | Szekely    |  |  |  |  |
| Arthur Davis                                | Lansing, Mich.   | Waco 10 T    | Wright J-6 |  |  |  |  |
|                                             |                  |              |            |  |  |  |  |
|                                             | September 5 (v   | /ITH BRAKES) |            |  |  |  |  |
| C. P. Kyser                                 | Wichita, Kan.    | Cessna       | Wright J-5 |  |  |  |  |
| Lloyd Yost                                  | Pinehurst, N. C. | Waco         | Warner     |  |  |  |  |
| Lester Glasscock                            | Dunedin, Fla.    | Stinson      | Wasp Jr.   |  |  |  |  |
| September 6 (Without Brakes)                |                  |              |            |  |  |  |  |
| Roger Don Rae                               | Lansing, Mich.   | Challenger   | OX-5       |  |  |  |  |
| Winston Krantz                              | Chicago, Ill.    | Aeronca      | Aeronca    |  |  |  |  |
| Russell Holderman                           | Le Roy, N. Y.    | Fleet        | Kinner     |  |  |  |  |
| September 7                                 |                  |              |            |  |  |  |  |
| Arthur Davis                                | Lansing, Mich.   | Buhl Pup     | Szekely    |  |  |  |  |
|                                             | Cincinnati, O.   |              | Aeronca    |  |  |  |  |
|                                             | Le Roy, N. Y.    |              | Kinner     |  |  |  |  |
| Event 35. Women's Deadstick Landing Contest |                  |              |            |  |  |  |  |

|            | Event 35. | Women's J | eadstick I | anding | Contest |
|------------|-----------|-----------|------------|--------|---------|
|            |           | August 31 | (WITHOUT   | BRAKES | )       |
| Betty Lund | Troy,     | 0.        | Aeron      | ca     | Aeron   |

Lansing, Mich

Mrs. A. Davis

Clema Granger

Mı

Flo

| Mary Charles                                     | Los Angeles, Cal.                                       | Swallow                       | Kinner                             |
|--------------------------------------------------|---------------------------------------------------------|-------------------------------|------------------------------------|
|                                                  | September 1 (w                                          | ITH BRAKES)                   |                                    |
| Flo. Klingensmith<br>Edith Foltz<br>Joan Shankle | Minneapolis, Minn.<br>Portland, Ore.<br>Ft. Sill, Okla. | Stearman<br>Bird<br>Stearman  | Wright J-5<br>Kinner<br>Wright J-5 |
|                                                  | September 4 (w                                          | ITH BRAKES)                   |                                    |
| Flo. Klingensmith<br>Mrs. A. Davis               | Minneapolis, Minn.<br>Lansing, Mich.                    | Waco F<br>Buhl Pup<br>Swallow | Kinner<br>Szekely<br>Wright I-5    |

| Jema Granger      | Danta Monica, Car. | DWILLION      | TTALBAC J O |
|-------------------|--------------------|---------------|-------------|
|                   | September 4 (WIT   | THOUT BRAKES) |             |
| Flo. Klingensmith | Minneapolis, Minn. | Waco F        | Kinner      |
| frs. A. Davis     | Lansing, Mich.     | Buhl Fup      | Szekely     |
| 357 77 1 0        | T. C. C. Prom      | Contine Daid  | C           |

| williffed Spooner | Deicester, Ling.   | Curtiss-recia O, po,  |
|-------------------|--------------------|-----------------------|
|                   | September 4 and 5  | (WITHOUT BRAKES)      |
| Flo. Klingesmith  | Minneapolis, Minn. | Waco F. Kinner        |
| Winifred Spooner  | Leicester, Eng.    | Curtiss Reid Gypsy    |
| Milder M.         | Daniel Lilla Cal   | Travel Air Wright L.5 |

| manage and See.                                |                                                  |                          |                                |
|------------------------------------------------|--------------------------------------------------|--------------------------|--------------------------------|
|                                                | September 5 (w                                   | ITH BRAKES)              |                                |
| Edith Foltz<br>Flo, Klingensmith<br>Betty Lund | Portland, Ore.<br>Minneapolis, Minn.<br>Troy, O. | Bird<br>Stearman<br>Bird | Kinner<br>Wright J-6<br>Kinner |
|                                                |                                                  |                          |                                |

| ema Granger<br>rs. A. Davis<br>o. Klingensmith | Santa Monica, Cal.<br>Lansing, Mich.<br>Minneapolis, Minn. | Swallow<br>Buhl Pup<br>Stearman | Wright J-5<br>Szekely<br>Wright J-6 |  |  |  |  |  |  |  |  |  |  |
|------------------------------------------------|------------------------------------------------------------|---------------------------------|-------------------------------------|--|--|--|--|--|--|--|--|--|--|
| September 7                                    |                                                            |                                 |                                     |  |  |  |  |  |  |  |  |  |  |
| Shankle S \                                    | Beverly Hills, Cal.                                        | Travel Air                      | Wright J-5                          |  |  |  |  |  |  |  |  |  |  |

|     | h Foltz   |     | Portland |          |     | Bird        |      | Kinner    |       |      |
|-----|-----------|-----|----------|----------|-----|-------------|------|-----------|-------|------|
|     | Event 36. | Air | Transpor | rt Speed | and | Efficiency, | Mult | i-Motored | Ships | ,    |
| Lee | Sherrick  |     | Canton,  | O.       |     | Ford Trim   |      |           |       | 22.6 |
|     |           |     |          |          |     |             |      | (2 Kinner | s).   | ~ .  |

| Waldo  | waterma | n Los | Truge  | ies, | Cal. Daci   | 1          | 1 Wasp     | (      |
|--------|---------|-------|--------|------|-------------|------------|------------|--------|
| Wm. A  | twell   | Clev  | eland, | 0.   | Siko        | rsky       | 2 Wasps    | 99.036 |
|        | Event   | 36-A. | Speed  | and  | Efficiency, | Single-Mot | ored Ships |        |
| Eldon  | Cessna  | Wic   | hita,  | Kan. | Cess        | na         | Warner     | 2010   |
| Walter | Carr    | Sam   | inner  | Mich | Core        | ma.        | Warner     | 1768   |

| II. I. Aillel     | 1109, 0.       | *************************************** | Continuen      |            |
|-------------------|----------------|-----------------------------------------|----------------|------------|
| Event 38.         | National Guard | Race for Douglas                        | Trophy (Hand   | licap)     |
| Capt. J. K. Gill  | Ohio N. G.     | O-38                                    | Hornet         | 143,234    |
| Lieut, W. Newhall | III. N. G.     | O-38B                                   | Hornet         | 142,841    |
| Lt. W. K. Ebel    | Md. N. G.      | O-38                                    | Hornet         | 142.513    |
| Special Sportsman | Pilot Race, Fr | ee-for-All (5 laps                      | 5 mile course) | (Handicap) |

| 7 | Lit. II. Is. Doci                              | Audi Ati Gi                                   | 0 00                         |                                  |                               |
|---|------------------------------------------------|-----------------------------------------------|------------------------------|----------------------------------|-------------------------------|
| ! | Special Sportsman                              | Pilot Race, Free-                             | for-All (5 laps 5 mile       | course) (Har                     | dicap)                        |
|   | Lloyd Layne<br>W. L. Stribling<br>F. W. Zelcer | Chicago, Ill.<br>Macon, Ga.<br>New York, N. Y | Laird<br>Travel Air<br>Laird | Wasp Jr.<br>Wright<br>Wright J-6 | 146,879<br>144,915<br>138,287 |
| ! | Event A.                                       | Men's 115 cu. in.,                            | Free-for-All (6 laps         | 5 mile course)                   |                               |
| H | Duke Muller                                    | Chicago, Ill.                                 | Heath                        | Continental                      | 91.128                        |
| : | W. Franklin                                    | Kankakee, Ill.                                | Church                       | Church J-3                       | 89,133                        |
|   | M. Lombout                                     | Chinago III                                   | Heath                        | Continental                      | 82,103                        |

| M. Lambert |       | L    | Chicago, Air. |       |     | 22000011 |     |    |    |    |        |    |      |   |        |         |        |
|------------|-------|------|---------------|-------|-----|----------|-----|----|----|----|--------|----|------|---|--------|---------|--------|
|            | Ev    | ent  | В.            | Men's | 115 | cu.      | in. | Α. | т. | c. | Race   | (6 | laps | 5 | mile   | course) |        |
| H.         | A. S  | Spee | r             | Cir   | cin | ati,     | 0.  |    |    | Ae | eronca |    |      | Α | eronc  | a.      | 75.571 |
|            | os. ( |      |               | Cir   | cin | ati,     | Ο.  |    |    | Ae | eronca |    |      | Α | eronc  | a       | 74.99  |
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остовек, 1931



Three Boeing Wasp-powered F4B-1 Navy fighters. (U. S. Navy Photo)



# The NAVY knows...

113

Boeing is proud of its navy service record! Boeing-equipped squadrons hold the vertical bombing and gunnery championship, the 1930 Schiff Memorial Trophy for flying without mishap, and other tributes to men and aircraft. Careful buyers recognize, in Boeing commercial models, the stimulus of the Navy's exacting requirements. These are a constant spur to Boeing engineers, whose fighters in Navy service today outnumber those of all other builders. Boeing Airplane Company, Scattle. Subsidiary of United Aircraft and Transport Corporation.

# HELPING Warner to win



BACK of the laurels won by Warner "Scarab" engines at the 1931 National Air Races is the master craftsmanship of the Govro-Nelson shops—where many of the parts used in these engines were machined with faithful accuracy, in a plant where the latest and most modern equipment is combined with aviation skill and experience that dates back to the beginning of the industry.

Information or quotations will be sent promptly upon receipt of your blue prints.

# GOVRO-NELSON

1931 ANTOINETTE DETROIT CRAFTSMEN TO THE AVIATION INDUSTRY

# MEASURED LIFT OF AIRFOILS

(Continued from page 47)

tunnel models are unreliable with respect to the determination of the burbling point of the corresponding full size wing. Even tests at full size would not solve the question. It is pretty safe to say that the interference of the fuselage and of other airplane parts exert some influence on the burbling point. The burbling point is only partially a function of the wing section, and cannot therefore be determined exactly or computed from the wing section as such.

Within only certain limits is the burbling point a property of the wing section. Within these limits experience has now shown that there exists a simple relation between the potential flow and the burbling point. The burbling point is itself a function of the potential flow; it is the point where this flow collapses like a column under its critical load. The potential flow of the primitive theory is always parallel to the trailing edge, but it does not hit the leading edge in its direction except at one particular angle of attack. At that angle, the wing section can be said to be most perfectly streamlined for its purpose. At that angle, it is best fitted to withstand the disturbing influence of the air friction.

The direction of best streamlining is close to the direction of the wing chord. With a wing section symmetrical fore and aft, the effective angle of attack zero gives a symmetric air flow, and hence one tangential at both edges.

Experience shows now that a small deviation for the angle of attack of best streamlining does not greatly interfere with the smoothness of the air flow. The ability of the potential flow to withstand the disturbing influence of the air friction, however, becomes smaller and smaller as the difference between the angle of attack and the angle of best streamlining grows. With almost all conventional wing sections, the critical point is reached when the lift coefficient is about .9 or almost 1.0 larger than at the angle of attack of best streamlining. A practical rule, originated by W. S. Diehl of the U. S. N., agrees in spirit with the above relation. Diehl uses the trailing angle. This is the angle between the wing chord and the tangent to the mean camber line at the trailing edge. Roughly speaking, the trailing angle is comparable to twice the characteristic angle, or to twice the angle between the chord and the average direction. It is a kind of measure of the mean effective camber. The rule for the burbling point says now that the maximum lift coefficient is about at CLIMAX- $.1(10+\frac{1}{2}\Omega)$  where  $\Omega$  denotes the trailing angle. It is a little lower if the trailing angle is larger than 12 degrees and the mean camber correspondingly large. The lift coefficient at zero angle of attack is about .1 .  $\frac{1}{2}\Omega$ . Strictly speaking, this would be the lift coefficient at the zero value of the effective angle of attack, but at those lift coefficients these distinctions will not make much difference.

With biplanes, the maximum lift coefficient is about 10 per cent smaller, particularly with the lower wing. The aspect ratio used for the induced angle of attack is the effective one, computed from the actual aspect ratio of both wings together, and by multiplication by the span factor. These are questions of detail and they do not affect the broad picture. With either type of wing, the maximum lift coefficient has a definite limit, which even with special devices can not be indefinitely raised. No plain wing section has a larger maximum lift coefficient than 1.5. Increasing to excess the camber and the trailing angle becomes finally ineffective, and is besides impractical because the drag and the travel of the center of pressure

become excessive.

We shall discuss the known and the prospective means for the increase of the maximum lift coefficient in a later article. Even the most optimistic expectations of such future increase are however insufficient to overcome the shortcomings of wings, finding expression in the existence as such of a definite limit of the maximum lift coefficient. Wings lift only when they move, and are thus imperfect for the performance of certain functions desirable for aircraft wings.

This is the sixteenth of a series of articles by Dr. Max M. Munk. Copyright 1931. All rights reserved by the author.

# THOSE REAR VISION RACES (Continued from page 42)

We had a champion dead stick landing contestant this vear-C. S. Reitzel. He saw he was overshooting, stalled, and fell right into the middle of the circle. That's what you call sticking at nothing to win. Next year he hopes to get above the circle, shut off his engine, and spin in.

Senator Hiram Bingham, Republican, Connecticut, President of the N. A. A .- to tell the worst about him at one fell swoop-was at his usual station by the announcers' stand, ready at a moment's notice to leap into any vacant spot on the program and send forth the glad news of the N. A. A. and all it had done for aviation. He and the robot had their pictures taken together, shaking hands. They made quite a pair. The robot was a bit snappier than Hiram, but outside of that you could hardly tell them apart.

You know, Hiram has been attending these races every year and it's always been a problem to know quite what to do with him. Well, this year I got him a job. It was a shock to him, too, for he's been unemployed for years and years-you can't get a Senator to do any work. Well, we had a fish pond in front of the stand, with a school of goldfish in it, so it just occurred to me to appoint Senator Bingham as Keeper of the Fish at the National Air Races. I announced it over the radio, and everybody agreed the good old Senator was just the man for the job. I instructed him in his duties, which were to go out and hold an umbrella over the fish when they were near the surface, in case they got their backs sunburned; and to put raincoats on them when it rained, so they wouldn't catch cold. He and the fish seemed very happy and contented together.

Phil Henderson was Keeper of the Sharks-the horde of carnivorous fish that went swimming through the stands yelling, "Hot dogs—popcorn—soft drinks—hard times—ice-cream—and sun glasses." These fellows became a pest after the first hour. Like a flock of cackling geese, they loudly hawked their wares. The public couldn't hear the announcers, the bands, the distinguished visitors, or the motors. I heard that several of these hawkers were killed and thrown under the bleachers by the infuriated spectators. Phil, let's put a muffler on these lads next year. After all, if a man wants a hot dog he'll buy it without being bellowed at.

This year the Public Address System was repaired, and under the direction of Bert McGrath, Chief Announcer, it functioned with the minimum of annoyance-which is a great triumph for this invention. The cheese salesman was off the air, so we didn't have to hear, seventeen times a day, "This address system is given us by courtesy of the Blah-blah Cheese Co. Eat more cheese." Jack Storey and Jim Ewing handled the races as well as they could considering that they only got a glimpse of the racers every now and then. Jim is the best race announcer I've heard; he has a remarkable memory for the positions and speeds

(Continued on following page)

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- Ground maneuverability in winds considerably above normal.
- The "guts" for acrobatics, if for no purpose other than the completion of advanced training.

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KREIDER-REISNER AIRCRAFT CO.

Hagerstown, Maryland

FAIRCHILD AVIATION CORPORATION

(Continued from preceding page)

of the racers, and can explain just what is happening so the crowd get it. As a speed event announcer Jim Ewing stands head and shoulders above anyone I've heard attempt

this difficult form of announcing.

I did a little chatter myself for a couple of trained seal acts. I barked for Hawley Bowlus, Warren Eaton, and Russell Holderman who performed in their towed gliders, and for Al Williams in a special demonstration of ground-to-plane radio communication, showing how the strong back is guided by the weak mind. When they came down I threw them each a herring, and they ambled off to their tanks very contentedly until the next performance. It's amazing what you can train these mammals to do, isn't it? By the way, it's well we had these acts, and the various naval and military events, for during the first two days of the "Races" there wasn't a single race. Old Cliff has got the National Air Races pretty well de-raced when he can run two days on stunts and formations, eh? And nobody complained! We'll get this thing down eventually so we can do away with the races entirely and substitute elephants and giraffes. I really believe the public would prefer it. When Vincent Burnelli arrived in his flying menagerie the crowd really expected a couple of elephants to appear. But they had to be content with Frank McKay.

As I'm running over my allotted space, I'll end this with my suggestions about next year's races. Let's change the set-up so we may have the advantages that were demonstrated at Chicago, when we could see the planes racing over the course, from start to finish. The horse race start, you know, with the scattering pylon, is my own contribution to air racing. I described it in detail in AERO DIGEST some years ago, sold the idea to Clifford Gildersleeve and Clifford Henderson—for nothing—and saw it

work out perfectly at Chicago last year.

The City of Cleveland owns not only the airport that is already in use, but also all of the land back of the grandstand, extending to the river. That land should be filled in, graded, drained, and prepared for flying before next summer. The cost of preparation of this land, now being wasted, will be about \$200,000. But when that money has been spent and the airport has been enlarged to that extent, Cleveland will have the largest and finest airport in the United States, if not in the world, and it will have the finest air racing plant in the country.

The present position of the stands is unfortunate for two main reasons: the race course cannot be in sight, and the light is bad. Facing east, there is a glare of sunlight for much of the day, and a light for at least three hours of the afternoon that is hard on the eyes. The easiest and best light is to the north. The stands should be removed from their present position and set up in the southwest part of the new field. From that position the light is easy on the eyes, and the course may be laid out so the racers are in sight all the way around.

The present stand position is at right angles to the prevailing winds, which are southwest in August and September. This results in the spectators baking in the sun, with no chance of a cooling breeze, which is shut off by the stands. In the new position the winds will sweep along the stands, cooling the fevered brows of those who have been heated up by one of Senator Bingham's speeches. A further advantage is that the planes, landing into the wind, will land along the stands, instead of at them.

With the stands facing north from the southwest corner of the new field, it will be possible to lay out a course on which the racing planes always will be in sight. At Chicago we had the natural advantage of rising ground on the

back stretch. We can duplicate that advantage on Cleveland's level course by this simple device: Procure two standard power transmission towers, which are about the desired height, and have them erected as pylons, using bolts, so they may be disassembled. Then rule that all planes fly at a height not lower than the tops of those pylons. This insures seeing them all around the course—and also—mark this advantage!—renders it impossible for too daring pilots to hit trees on the course, as was done on at least one occasion this year. The only place on the course where the ships will be low will be upon approaching and departing from the home pylon, around which the turn should be at an angle sufficiently acute to add the usual spectacular turn feature. The home pylon can be out in the field far enough to insure the safety of spectators.

I earnestly suggest that the improvement of Cleveland Airport be undertaken at once in order to provide employment for many men during the winter months. This promises to be a hard winter—the Cleveland Community Chest will be taxed to the utmost. Is it not a sound time to undertake needed work, at a time when so many need work and cannot find it? What I suggest about enlarging and improving the field always was contemplated—that land was bought in order to have it available for more landing space when it was needed. Well, it is needed now; the men who will work on it need work; the money should be available. I know Cleveland and the public spirited men who have made it the very admirable community it is; I cannot believe that they will hesitate to provide the money required for this improvement.

The work, of course, should be under the direction of Major Jack Berry, the very efficient manager of Cleveland's Municipal Airport. Give Jack the means, and he will develop the rest of the field to fit with the excellent plan under which he has developed that part now in use. It is not necessary to raise the level of this new part to that of the present field—a moderate slope will be perfectly safe and will afford better opportunity for drainage. Furthermore, a road of inexpensive construction, level with the field, should lead from the new field to the hangars, within the limits of the field. This was a feature badly needed this year. The present road behind the stands would be discontinued, and a new road prepared to run along the edge of the river.

Cleveland Airport should be enlarged if it is to be the air racing center of America. What better time to do the work than when labor and materials are at low prices? What better time to undertake municipal improvements than when many of the dwellers in the municipality need work and are demanding it? Finally, give the public real air racing and they will turn out in sufficient numbers to more than repay the added cost of providing the necessary field facilities.

The people of Cleveland are to be congratulated on their achievement this year—a remarkably fine example of public spirited effort at a time when many communities lack the financial courage necessary to put on such an event. I hope they will forgive this old pilot for suggesting that even better may be done in 1932. I don't think I'd suggest it if I didn't know that Cleveland never has been satisfied with anything that fell even a little short of perfection.

## MICHIGAN AIR BOARD (Continued from bage 44)

and aircraft accessories. It has some of the outstanding manufacturers in the state. When the industry is finally stabilized it will no doubt be found that just as Michigan (Continued on following page)

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## S P A R T A N

MUNICIPAL AIRPORT

TULSA, OKLAHOMA

#### (Continued from preceding page)

dominates the world in the production of motorcars so will be it dominating the field in aircraft production. It now has such outstanding manufacturers as Ford, Buth, Verville, Lockheed, Ryan, Driggs, Packard, Warner, Continental, Rover and Szekely. In addition to commercial aviation activities Michigan has several military aviation organizations which bring over a million dollars into the state annually. There is Selfridge Field, headquarters of the Regular Army organization, and there are the National Guard Squadron, the Naval Reserve Squadron, and the recently formed Marine Corps Reserve Squadron.

Northern Michigan offers to the world one of the finest playgrounds, both for summer and winter. The airplane offers itself very admirably as the natural transportation medium for reaching this area of scenic beauty. When landing fields are established throughout this northern country, many metropolitan dwellers will be establishing winter as well as summer colonies and commuting by airplane, as they are now doing with motorcar to their present cottages fifty miles from their office.

The upper peninsula, separated as it is by Lake Michigan from the lower peninsula, has little business or social connections with the lower peninsula. The residents of the upper peninsula transact a great deal of their business with Milwaukee, Duluth and Chicago, and read the papers of Wisconsin and Illinois. Since these two peninsulas are politically connected there should be closer business relations, and this can be brought about by the airplane. Whereas it takes twelve hours from Sault St. Marie and sixteen hours from Marquette to Detroit by train or automobile, the airplane will bring them three and four hours respectfively from the state's largest metropolitan area.

## THREE WEEKS' LEAVE

(Continued from page 43)

navy, the tourist, the wealthy man or the amusement of a holiday crowd. But not as a universal transportation utility.

It is perfectly safe to say, I think, that a hundred Americans have flown for every Englishman who has seen something of his country from the cockpit or cabin of an airplane. They are, in a word, not air-minded, unless it be for military or sporting purposes. They were ready to turn out in thousands to see the Schneider Cup races, because that was expected to be a sporting proposition. But they don't fly, and they don't expect to fly this side of heaven.

I think I recognized some sound reasons for this state of affairs. The first is the fact that the Englishman has a good deal on his mind at the moment. He can't afford to fly, and not many of him can afford to own or operate an automobile, with gasoline at thirty cents a gallon and taxes out of sight. Flying is still on the border line between necessity and luxury, and the average Englishman must get along without luxuries, which he does—to his great credit—with courage and good cheer. And with such matters as the dole, the gold standard, the national debt, the foreign market, the high cost of living and the Socialist Party to think about, he may be readily excused for showing only a minimum interest in air transportation.

A second reason, I should say, is the English weather. I don't think I should care to be operating an air taxi service under the meteorological conditions which pervaded the British Isles this summer. We ourselves were extraordinarily lucky with the weather. We arrived in England just two days after a terrific storm, when three inches of rain fell on the Southeast counties in two days. We went North into fair weather, but the day after we left

they had the worst storm in fifty years. We arrived in Somerset in time to miss another deluge. The day after we sailed for home it started to rain in London again and kept it up for most of a week.

But though we saw the best weather of the summer during our eleven days visit, it wasn't what you might call good flying weather. For four days we drove more than a hundred miles a day. We were in and out of sun and storm, thunder clouds and clear skies, downpours and drizzles and serene sunshine. Sometimes it was warm and sometimes it wasn't, and the ceiling couldn't be trusted for ten minutes of flying time. And though we studied the weather reports with anxious interest, we never found one that would say in so many words what was ahead of us.

That sort of thing, you must admit, is a shade discouraging to scheduled air operations. The average Englishman, I think, will prefer to trust the train for a long time to come. He has, moreover, plenty of trains to take him where he wants to go and at a fast pace. There are over 20,000 miles of rails in Great Britain, most of them in England. Texas has the most railroad miles of any State in this country with 16,890 miles, but her area is five times that of England. Pennsylvania has the third highest mileage in America with about 11,000 miles, and her area is just about that of England. The airplane in England, therefore, must compete with an elaborate system of railroads, on which the long distance trains do fifty and sixty miles an hour as a matter of course. It's a heavy handicap.

I think I noticed another good reason for the scarcity of aircraft during my journeys around the tight little island. In most of the country we visited there wasn't anywhere to sit down. The Yorkshire moors look like open country on the map, but they are all humps and hollows and it would be tough to land on them. In middle England the land is everywhere cut up with trees and stone walls and hedges, so that hardly a field is more than half a dozen acres in size. There may be good cruising country somewhere in England, but I didn't see it. And there may be airports all over England, but I didn't see them either.

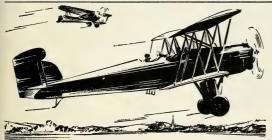
The moral of the story is that the real development of useful air transport is this country's job, even though English military aircraft may be faster than ours and though nobody could keep old England from copping the Schneider Cup. I heard the same story from certain parties who are trying to promote an important aeronautical enterprise over there. They looked across the Atlantic as though they were gazing at the promised land. There, they said, was a country where an airplane might pay its way. There was the money, and space in which to fly, and places to go and reasons for going there. And I might have told them that in the United States there is also a present and potential crop of cash customers for air transport which has no equivalent in England. The facts and figures were waiting at home for me to prove it, when I returned from my extensive travels and profound studies. For the well-known Ludington Line carried in July and August more passengers than all the sixty Luft Hansa lines of Germany in the same period; it averaged during the summer as many customers per day as cross the English channel in a week. And as for intercity air traffic in England-it would be just too sad to make any comparisons.

So I came back in comparatively cheerful mood to a reconsideration of the trials and tribulations of our favorite industry. They might be so much worse. That, by the way, goes for nearly everything connected with our current complaints and grievances. There is not much comfort in contemplating the troubles of a neighbor who is worse off

(Continued on following page)

OCTOBER, 1931





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### (Continued from preceding page)

than ourselves, but it sometimes persuades us to bear our own burdens without squealing. And England's distresses are deep and dark, though the English people face them courageously and with an obstinate conviction that they will eventually come out of them.

One other conviction came home with me on the Berengaria. I have sometimes expressed the opinion that speed for its own sake is nonsense. To tear about at three hundred miles an hour is an unprofitable performance if you are going nowhere in particular. But I'm bound to admit that it was the pace of the modern world that permitted me to spend my three weeks leave in a European tour. On Wednesday of one week we were making merry in New York and arousing the envy of our friends who could not come along. Because the Aquitania is a fast boat, we spent the next Wednesday evening in a London theater. We left England again on a Saturday, after eleven busy days which covered a thousand miles and included real visits to Yorkshire, Essex, Stratford, Oxford, Warwick, Bath, Glastonbury, Wells and Salisbury, with considerable time in London. On Friday evening we were once again at the theater; the following Friday the Berengaria had brought us back and we were on our own doorstep.

I don't doubt that the crossing will be made before long in two days, in full comfort and safety, by way of the air. And when that day comes I shall not need to take an extra week over and above the vacation allowed to impoverished journalists in order to visit the land of my fathers. Two weeks will be plenty to provide a first class holiday and enough material for an article in this enlightened publication. Three weeks will be sufficient to start me writing a book about it.

#### RHOEN SOARING CONTEST

(Continued from page 49)

kilometers (119.3 miles) from the starting point. Both of these flights were remarkable because of the fact that they were made on thermal currents alone; up to this time such long flights had been made only by flying in front of thunderstorms.

The last day, August 5th, was one not easily forgotten by many who witnessed the contest. Kronfeld, who had been forced to withdraw during the first part of the contest because of fabrication troubles on his Wien and who on two other occasions could not fly because of illness, appeared at the starting place. A number of take-offs had been made by the Junior pilots, but the longest flight had been only a glide of about two minutes. The wind was too light for soaring and the sky had very little traces of (Continued on following page)



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**OCTOBER**, 1931

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cumulus formations. Kronfeld took off at 12:06 and for one hour and twenty-four minutes soared on the lightest wind I have ever witnessed. I watched him gain on the slightest puff, never sacrificing an inch unnecessarily. Sometimes he would be at the treetops and it would appear that he must land-but somehow he would remain aloft, then finally begin to spiral and climb. It was a very weak thermal, but Kronfeld staved with it and attained an altitude sufficient to jump over to a large cumulus formation some miles away. He was lost to our view at a great altitude. During the time he was flying back and forth on the light deflected wind, many pilots who were watching him took off and attempted to soar. It was very interesting to watch them; among the machines was the Musterle, piloted by Wolf Hirth, who started off from the hill and flew side by side with Kronfeld. However, seven minutes was his limit. His machine was rushed back up the mountain for another start and just as Kronfeld struck a strong thermal current which carried him up to his first real altitude, Hirth took off again, but was forced to land after being in the air slightly over two minutes.

This remarkable flight of Kronfeld ended six hours and twenty-five minutes after his start; he landed 176 kilometers (109.36 miles) away, near Arnsberg in Westfalen; the entire flight was made on thermal currents mostly above 3,000 feet. Although Kronfeld did not win the distance contest, I believe this flight was of more value to the scientific side of soaring flight and unquestionably was one of the greatest flights of the contest, soaring as he did when no other machine could remain up and then making a distance flight entirely on thermal currents which were

few and far between.

I was accompanied abroad by Augustus Post, well-known in aviation for many years and as author of several books and many articles on aeronautics. He has made a study of the organization of gliding and soaring as developed in the last twelve years in Germany, to see how the movement might be advanced in America. We studied the construction of the latest high-performance soaring planes, visited the factories and met many officials in all branches of aeronautics, who received us with the utmost courtesy and kindness and showed a deep interest in what was being done in America. We also conferred with authorities from France and England. Two American students accompanied us part of the way-I. McClure Patterson of Dayton, Ohio, and Vernon Thomas of Boston, Mass. During their stay in the glider camps they made the "B" and "C" licenses. Mr. Patterson made his "B" and Mr. Thomas soared for twenty-five minutes on his first soaring flight.

My visit to the German Contest and schools was a great revelation. The famous Wasserkuppe has many natural and useful facilities for soaring and the study of soaring flight. Soaring has the close cooperation and financial backing of the German government and the leading scientific organizations. In the United States, on the other hand, suitable terrain has been discovered and noteworthy flights have been made by Americans in the ships which they now have available. I believe that while Germany has spent twelve years in development of gliding and motorless flight, when this is compared with American development in three years, we are as nearly far advanced. If the coming year produces some American high-performance soaring machines, unquestionably the world's records for soaring will come to this side of the water. It is my opinion that the average American students in the schools and clubs using auto-towing methods are superior to those trained by the present German methods.

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## WIND TUNNEL STUDIES OF AILERONS

HE Aeronautics Branch of the Department of Commerce, through its research division located at the Bureau of Standards has carried out certain wind tunnel studies of the standard type of lateral control of airplanes in relation to safety.

It is generally known that the pilot of the conventional airplane needs to be able to steer his craft in three ways: (1) By means of a rudder to turn the nose of the airplane to the right or the left, (2) by means of an elevator to raise or lower the nose, and (3) by means of some method of raising or lowering one wing tip with reference to the other, to roll the machine about its longitudinal axis. This last, or lateral control, is commonly effected by use of ailerons, the technical name for two hinged flaps, one generally at the trailing edge of each wing near the tip, which are interconnected so that when one is turned down the other is turned up. The ailerons are actuated by the side-to-side motion of the control stick or the right-left turns of the control wheel if the latter is employed. If the right wing is lowered by a gust of wind, the flap on this wing is turned down and the action of the air is such as to raise the right wing. Simultaneously the flap on the left wing is turned up to depress the left wing. It is found by experiment that the forces produced are much greater than those that would be produced on the area of the flap alone and that the movement of the flap alters the force on the whole tip of the wing.

The ideal lateral control would be one which rolled the machine and did nothing else, no matter what the attitude of the machine. But the simple allerons are far from ideal. Their disadvantages may be briefly outlined as follows: As the forward speed of the airplane is decreased, the rolling effect produced falls off very rapidly, much more rapidly than would result from the decrease in speed alone. The trouble is caused by the wing reaching the stalling angle (angle at which the lift reaches its maximum value), so that turning the aileron down increases the lift by only a small amount.

Conventional ailerons are subject to a second difficulty. The motion of the ailerons not only alters the lifting force of the wing tips but also alters the drag or resistance to motion. If both tips are equally affected with respect to drag, no important tendency to yaw the airplane would be introduced, but under ordinary conditions the downward aileron has the greatest drag. The result is that the application of the ailerons to lift a low right wing results in greater drag on the low wing, thus retarding it and turning the machine to the right unless the rudder is used simultaneously to counteract the yawing moment arising from the displacement of the ailerons. The turning causes the high wing to move faster, which as a secondary effect increases the lift on the high wing, tending to lift it still higher. This effect becomes more and more pronounced as the stalling angle is approached and constitutes a hazard in addition to that previously described. The inexperienced pilot trying to fly at a very low speed approaches the stalling angle, a wind gust lowers one wing, the natural and usual corrective motion of the control stick sends the low wing still lower, pivots the machine about the low wing and sends it into a spin.

These disadvantages of the standard aileron control have been known for many years and no effort has been spared in attacking this problem. While steps have been made in this direction, research is still in progress looking toward the development of a more satisfactory method of control. The fact remains, however, that the great majority of airplanes submitted to the Aeronautics Branch for approval make use of the convention control. The importance of a full study of the convenient control is therefore self-evident. Especially is it important to ascertain whether the safety of the airplane can be increased to a moderate extent by inexpensive modifications of the standard type or by a suitable choice of shape and size of aileron. The region of particular interest is that near and above the stalling point.

The purpose of the experiments by the aeronautics research division of the Aeronautics Branch at the Bureau of Standards was to study the behavior of the conventional aileron at large angles of attack. The program correlates with the investigation of new types of control by the National Advisory Committee for Aeronautics and, in fact, the technical reports of these experiments are submitted to and published by the committee, thus making the information readily accessible to the design staffs of commercial companies. Three reports have been issued so far. They are as follows:

Heald, R. H. and Strother, D. H.: Effect of Variation of Chord and Span of Ailerons on Rolling and Yawing Moments in Level Flight N. A. C. A. Technical Report No. 298, 1928.

Heald, R. H., Strother, D. H., and Monish, B. H.: Effect of Variation of Chord and Span of Allerons on Rolling and Yawing Moments at Several Angles of Pitch. N. A. C. A. Technical Report No. 343, 1929. Monish, B. H.: Effect of Variation of Chord and Span of Ailerons on Hinge Moments at Several Angles of Pitch. N. A. C. A. Technical Report No. 370, 1930.

The aileron measurements were carried out on a model of five-foot span and 10-inch chord in the 10-foot wind tunnel of the Bureau of Standards at wind speeds up to 80 feet per second. The model was therefore larger than those previously used for aileron measurements and the effect of size of model compared to full scale correspondingly less. Seven ailerons, varying in width (chord) and length (span) were used on two well-know wing sections (USA 27 and Clark Y). The angle of attack of the wing was varied from 4 degrees to 16 degrees in all cases and for two of the ailerons to 40 degrees.

For a given aileron, set at a given angle on a particular wing at a fixed angle of attack, three quantities need to be measured. namely: The effect in rolling the machine, or the rolling moment; the effect in turning the machine to the right or left, or the vawing moment; and finally, a quantity termed the hinge moment. This last quantity is a measure of the force which the pilot must apply with a definite leverage to hold the aileron in position. Obviously if this force for any aileron setting exceeds his strength, the pilot can not move the aileron to that position. Each of the three quantities is a function of the wing section used, the aileron size and shape, the aileron angle, the angle of attack of the wing, and the wind speed, As is usual in airplane problems, the selection of an aileron size, angular travel, and leverage ratio for the control stick is a matter of compromise and the results of the tests can not be reduced to a single formula or general statement.

In general the upward motion of the aileron produces a greater rolling moment and a smaller yawing moment than the downward motion. For a considerable range of upward angular travel the direction of the vawing moment corresponds to a reduction in drag and is such as to produce a rolling moment due to vaw opposing the rolling moment due to the aileron setting. With a large aileron travel, however, the yawing moment becomes such as to help the aileron. the higher wing tip having increased drag. In all cases the yawing moments produced by upward travel of one aileron alone are much less than those produced by the conventional combination. Very definite aerodynamic advantages are indicated for the use of upward travel alone, or as near approach to it as possible. One method of accomplishing this is through the use of a cam or other mechanical device which would retain the normally down-moving aileron in the neutral position while displacing the other aileron upward. In practice, however, it may prove simpler to use a differential motion of the two with as large a ratio of up movement to down movement as mechanically possible. The outstanding disadvantage is that the rolling moment produced by upward travel alone is not as great as that produced by the conventional aileron combination, although the contribution of the up aileron to the total rolling moment is greater than that of the down aileron. A compromise in the way of larger ailerons, greater travel, or possibly both, is necessary. It is believed that the matter is worthy of further study on full-scale airplanes in the direction of better control at low speeds.

The wind tunnel measurements show the very great decrease in effectiveness of the aileron when the stalling angle is reached and indicate in general that an aileron of given size is somewhat more effective on the USA 27 section than on the Clark Y. The rolling moment produced is somewhat greater and the yawing moment somewhat less on the USA 27 section.

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| Juan de la Cierva and Don Rose\$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |
| Joseph Lewis French                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |    |
| 20 HRS. 40 MIN. Amelic Berhart. \$2.50 LEGY George and James Glimon. \$2.50 AL Day George and James Glimon. \$2.50 AL Day George and James Glimon. \$2.50 AL Day George and James Glimon. \$2.50 ANDLKEES STOKN. Ledied by the Swedsh Son Cites for Anthrophology and George Stoke |    |
| AIR NAVIGATION AND METEROLOGY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |    |
| AVIGATION BY DEAD RECKONING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |    |
| LINE OF POSITION BOOK.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |    |
| PILOTS HANDBOOK 1931                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |
| Chas. M. Thomas25e THE NAVIGATION OF AIRCRAFT.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |    |
| THE NAVIGATION OF THE AIR AND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| METEOROLOGY. Capt. Leslie Potter\$4 BALLOONS AND AIRSHIPS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |    |
| AEROSTATICS, E. P. Warner\$4.00 AIRSHIP DESIGN. Charles P. Burgess\$9                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |    |
| BALLOON AND AIRSHIP GASES, C. deF. Chandler and W. S. Diehl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |    |
| R. H. Upson and C. deF. Chandler\$5                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |    |
| PRESSURE AIRSHIPS. T. L. Blakemore and W. Watters Pagon\$8                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |    |
| APPLICATION. Capt. P. H. Summer\$4.25                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |    |
| Hugh Allen50c                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| AEROPLANE CONSTRUCTION, OPERATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
| AEROPLANES, SEAPLANES AND AERO EN-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |    |
| AIRCRAFT FLOAT DESIGN. \$4.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |    |
| AIRCRAFT PROPELLER DESIGN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | -  |
| AIRPLANE MECHANICS RIGGING HAND                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |    |
| AIRPLANE STRUCTURES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |
| OXY-ACETYLENE WELDERS' HANDBOOK                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | ,  |
| PREPARING FOR AVIATION. Lieut. V. C.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |    |
| SCREW PROPELLERS (3rd edit. 2 Vols.).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | ,  |
| SIMPLIFIED TIME CHART OF THE WORLD.  CHARL M. TOATION OF AIRCRAFT.  25e THE NO IGATION OF AIRCRAFT.  44.50  METEGROUND CAPT LEIME PATER  ANUGATION OF THE AIR AND METEGROUND CAPT LEIME PATER  44.00  AIRCRITE AND CAPTIVE AIRCRAFT.  45.00  AIRCRITE AND CAPTIVE BALLOOMS.  R. H. Upton and C. 48F. Chandler.  52.00  FRESSURE AIRSHIPS.  Waster Pagen.  45.00  APPLICATION. Capt. P. H. Summer.  46.00  APPLICATION. Capt. P. H. Summer.  47.00  ARROHAND OF THE AIRCRAFT.  DESIGN CONSTRUCTION. OPERATION  ARD DESIGN.  ARTHAUM CONSTRUCTION. OPERATION  ARD DESIGN.  ARTHAUM CONSTRUCTION.     | 1  |
| ELEMENTARY (General)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | ]  |
| Capt. V. W. Page (new edition)\$1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |    |
| M All Prices A FRO DICES                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | ,, |

## FOR SALE BY AERO DIGEST BOOK DEPARTMENT

| A B C OF FILIGHT Lowrence Left Page 1, 11, 10, 18 C OF GLIDING AMB Sample 11, 110, 110, 110, 110, 110, 110, 110,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |  |  |
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| A R C OF CLIDING AND SALIPIVING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |  |  |  |  |  |  |
| Marca V W Page aloth 82 seems 81 60                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |
| APDODATICE L. Desta                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |
| AN ELEMENTARY COURCE IN COLERA                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |  |  |  |  |
| AN ELEMENTARY COURSE IN GLIDER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |  |  |  |  |
| FLYING (set of hve) Capt. Arthur La Ros.\$1.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |  |  |  |  |
| BOOK OF THE AEROPLANE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |  |  |  |  |
| Capt. J. Laurence Pritchard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |
| DICTIONARY OF AERONAUTICAL TERMS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |  |  |  |  |
| S. Vanier (German, English and French) \$1.65                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |
| ELEMENTS OF AVIATION.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |  |  |  |  |
| Virginius Evans Clark                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |  |  |  |  |
| ELEMENTARY AERONAUTICS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |  |  |  |  |
| Albert P Thurston D Cc 92 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |  |  |
| FI EMENTARY AFRONAUTICAL SCIENCE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |  |  |
| 1 B Hast and W Laudier 92 50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |  |  |
| PIEMENTARY I APORATORY APPORT                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |
| ELEMENTARI LABORATORI AERODI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |
| TIME CO. ATTANY L. JOYGGN                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |
| ELEMENTARY ARRONAUTICAL SCIENCE, J. B. Harr and W. Londer, ELEMENTARY LABORATORY ARRODY, NAMICS. Arthur L. Jordan, 80c EVERYBODY'S AVIATION GUIDE. 80c                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |  |  |  |  |
| Maj. V. W. Page. \$2 EVFRYMAN'S BOOK OF FLYING. Orville Kneen \$3.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |
| EVERYMAN'S BOOK OF FLYING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |
| Orville Kneen\$3.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |
| GLIDERS AND GLIDING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |  |  |  |  |  |  |
| Ralph Stanton Barnaby\$3.00                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |
| HOW TO FLY. Barrett Studley                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |
| HOW TO FLY AN AIRPLANE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |  |  |  |  |
| Orville Kneen \$3.50 GLIDERS AND GLIDING.  Kulph Stanton Barnoby.  \$1.50 Kolph Stanton Barnoby. |  |  |  |  |  |  |
| IF YOU WANT TO FLY.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |
| Alexander Klemin \$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |  |  |  |  |
| MANUAL OF FLIGHT Issue F Flow \$2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |  |  |  |  |
| MODERN AIRCRAFT Main V W Bear OF                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |  |  |
| MODERN AIRPLANT Bestern W D                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |
| MODERN PLICHT CL. J D Classes                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |
| DRACTICAL PLICITY TRAINING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |
| PRACTICAL PLIGHT TRAINING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |
| Lient Darrett Studiey, U. S. N                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |  |  |  |  |  |  |
| PRACTICAL FLYING. Byron Q. Jones\$3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |  |  |  |  |  |  |
| SIMPLIFIED AERODYNAMICS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |
| Alexander Klemin\$3.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |  |  |  |  |  |  |
| SKYCRAFT. Augustus Post\$3.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |
| SKYWAYS. General Willsam Mitchell \$3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |  |  |  |  |  |  |
| STUNT FLYING. Capt. Richard Duncon. \$2.50 THE AEROPLANE SPEAKS. H. Barber. \$3.50 THE AIRPLANE. Frederick Bedeil                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |  |  |  |  |  |  |
| THE AEROPLANE SPEAKS. H. Barber. \$3.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |  |  |  |  |  |  |
| THE AIRPLANE. Frederick Redell \$3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |  |  |  |  |
| THE ART OF FLYING.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |  |  |  |  |  |  |
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| THE COMPLETE AIRMAN Cast C C                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |  |  |  |  |  |  |
| THE COMPLETE AIRMAN, Capt. G. C. Balley \$6.00 THE BOOK OF GLADERS, Edwin Way Teale \$2.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |  |  |  |  |  |  |
| THE BOOK OF CLUDEDS Edmin Wan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |  |  |  |  |  |  |
| Tools Of GLIDERS, Eswin Way                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |
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| ENGINEERING                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |  |  |  |  |  |  |
| AIRPLANE STRESS ANALYSIS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |  |  |  |  |  |  |
| Alamada Piness ANALISIS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |  |  |  |  |  |  |
| Alexander Klemin                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |  |  |  |  |  |  |

| DINAMICS OF AIRPLANES AND AIRPLANE                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
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| STRUCTURE. J. E. Younger and B. M.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Woods\$3.50                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| ELEMENTS OF AEROFOIL AND AIR-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| SCREW THEORY. H. Giauers                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| ENGINEERING AERODYNAMICS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| ENGINEERING AERODINAMICS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| Diehl                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| FUNDAMENTALS FOR FLUID DYNAMICS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| TOO THE PORTE OF THE PROPERTY |
| FOR AIRCRAFT DESIGNERS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Dr. Max M. Munh                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| Dr. Max M. Munh. SIMPLE AERODYNAMICS AND THE AIR-                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
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| SKY HIGH.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
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| INSTRUMENTS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| AIRCRAFT INSTRUMENTS.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
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| LANDING FIELDS AND AIRWAYS                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
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| AERONAUTICAL LAW.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| W Jefferson Denis                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| AIRCRAFT AND COMMERCE IN WAR.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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| AIRCRAFT LAW-MADE PLAIN.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
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| J. M. Sparaht                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
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## EXPERIMENTAL

(Continued from page 111) could be letters as well, as their use is for comparison only.

#### The Test Object

The upper member of the secondary frame (13) mounts the test object, whether it be wing, stabilizer or fuselage. Wire clips press over the frame member (13) making it possible to alter the incidence by raising one or the other clip. It is very important, of course, to place the objects at a uniform height above the fulcrum points (15)-otherwise the comparison will be upset. Similarly the centers of pressure of wings of varying chord lengths must be made to coincide so that the lift values are not disturbed. The diagram shows the lift and drag arms about their centers.

#### Procedure Used in Testing

A large portable fan is used to create an air blast. It is operated at slow speed in order to reproduce more exactly the conditions found in flying models. The test wing is carefully mounted, at the desired incidence, to frame member (13). The incidence is checked with the air stream rather than the frame. For lining up purposes a flat plate may be used, which should record drag but zero lift when at zero incidence.

For best results a particular series of tests should be run on a certain day, which will eliminate many discrepancies, due to temperature, air density, fluctuations in air velocity due to the electric fan, etc. It would also seem that light steel tension springs would be far more uniform than the rubber strands in the frames.

If, for example, we were making a comparison between the efficiency of two model wings of the same area and wing section, but different aspect ratios, we would first run one through several angles of incidence, noting carefully each reading for both lift and drag. We would now test the other wing, taking care to locate the C.P. over the same point, and making any required adjustment for weight difference by sliding the weight so as to start at zero. By taking a corresponding set of readings for the second wing we would have enough data to plot curves of both lift and drag. We would use on one side of our chart the angles of incidence, and on the other, the values read from our indicator. We could check the burble points of each to learn if aspect ratio had any effect on this important item. This is real model airplane research work. It is, we might say, model aerodynamics. Soon we would have special wing sections discovered, which would have high lift and low drag characteristics. Clark Y might soon be discarded as a popular model wing section, giving way to the Projansky W or the Jones X, and so forth.

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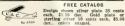
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YOUNG MAN, 18, high school graduate, good character, ability, wishes position in aviation with reliable company or concern. Work for living expenses and chance to learn. Go anywhere, do anything. Excellent references. W. L. Vance, 321 Main, Vandalia, Illinois.

321 Main, Vandalia, Illinois.
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TRANSFORT PILOT: Experienced in navigation, meteorology and night flying; open and cabin process for the property of the property of the process of the process

DIGEST, Box 1211.

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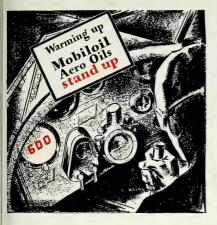
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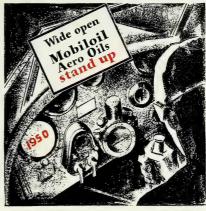
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NOVEMBER, 1931



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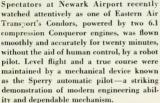
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equipment gives a similar demonstration of reliability: maintaining prompt and regular flying schedules up and down the Atlantic seaboard.

Dependable engine operation, which is es-

Dependable engine operation, which is essential to any air transport system, requires an ever ready supply of uniform high-quality aviation gasoline. Like other systems, Eastern Air Transport uses Stanavo Aviation Gasoline in all its airplanes, from the smallest mail plane to the great Curtiss Condors carrying 18 passengers and crew of three.



H. A. Elliott, of the Eastern Air Transport Company, testing the control action of the robot.

## STANAVO AVIATION & GASOLINE

STANAVO SPECIFICATION BOARD, Inc.

Organized and Maintained by Standard Oil Company of California 225 Bush St., San Francisco

Standard Oil Company (Indiana) 910 South Michigan Ave., Chicago

Standard Oil Company of New Jersey 26 Broadway, New York

# FIRST non-stop trans-Pacific Airplane Flight

# made with CHAMPION dependable

Spark Plugs



Hugh Herndon (left) and Clyde Pangborn (right) upon landing their Champion equipped Bellanca plane after the first non-stop trans-Pacific flightwired"Champion Aero A Spark Plugs used on our Miss Veedol flying across both Atlantic and Pacific oceans, functioned perfectly in every kind of weather.'



When Hugh Herndon and Clyde Pangborn landed their plane at Wenatchee, Washington, they completed the most difficult phase of their 'round-the-world flight, and the first non-stop Pacific crossing by plane. Despite adverse weather conditions they set a new record from London to Tokio. Most of the credit for this epoch making flight belongs to the fliers themselves.

Beset by protracted delays in Japan, the fliers never for a moment lost sight of their original objective. It is to their everlasting credit that they were the first to span the Pacific.

It is on epoch making events like the Herndon-Pangborn flight in which Champions dramatically demonstrate that they are Champions both in name and in fact

The demand for Champion Aero Spark Plugs from transport and mail lines and private operators, is constantly growing. The

reasons are real and obvious.

The unique dual insulators of exclusive Champion Sillimanite not porcelain—are so designed that they cannot be broken in such a way as to interfere with engine operation. In addition the design provides the maximum heat range so necessary for safety and dependability. Install Champions in your ship

and your conception of dependability will be boosted to a new high level.

# CHAMPION

**Aviation Spark Plugs** 

Toledo, Ohio

Windsor, Ont.



Champion Aero A Exclusive Features

• 1. Restricted bore. 2. Special analysis electrode. 3. Secondary sillimanite dome insu-lator. 4. Welded steel terminal. Copper seal. 6. Primary sillimanite insulator. 7-8. Molded Copper gasket seals.

# In the Air LINCOLN-TRAINED MEN



Student Welding



Tuning Up Motors

## En Español...

Ofrecemos enseñanza en español en los cursos de Aviación que se enseñan en Este Colegio.

Esta Escuela está autorizada por el Gobierno de los EE. UU. para traer estudiantes del extranjero. Pida informes gratis.

## World's Best Known School!

Lincoln is the best known Aviation school in the world. Students have come here from many distant climes. We have enrolled men from China, South Africa, Scotland, Alaska, Canada, South America, as well as from practically every state in the U.S.

## 12 Years' Experience ... Extensive Instructors . . . Enable This

No wonder Lincoln-trained mechanics and pilots get the most responsible, best-paying positions. No wonder this school is known at airplane factories and airports as the school that produces the best men for the jobs. The superior training Lincoln students receive is the secret!

12 Years' Training Aviation Students—The Lincoln School has had 12 years' experience training Aviation students—10 years more than most civilian Aviation schools. During this time—an age in the infant industry of Aviation—we have developed a system of training equalled by no other school. A system in which no detail of training is overlooked. A system which not only assures you more thorough, more practical training—but which, through economies we have learned, enables us to train you at a very reasonable tuition charge—lower than that of other schools which offer anywhere near our high standard of training and extensive facilities.

Extraordinary Training Facilities—The Lincoln School maintains a complete Mechanics' School and a complete Flying School. Also offers courses in airplane welding and aerial radio. Our extensive, modern, practical facilities include \$250,000 worth of buildings and equipment. A \$100,000

airport, with all-weather runways and lighted for night flying. A large fleet, including 4 distinct types of government-approved training planes. Seasoned, government-licensed instructors—who are interested in the personal welfare of each and every student. And our Mechanics' School is connected with a large airplane factory—students receive instruction according to actual factory standards.



One of Our Lady Student Pilots

## LINCOLN

Airplane & Flying School
305-A Aircraft Bldg. Lincoln, Nebr.

Government Approved—Highest Rating



These students knew where to come for the best training,

LEARN AVIATION AT LINCOLN.... WHERE

## ···and on the Ground THE BES

## Facilities and Seasoned School to Give Better Training

Mechanics Needed-The steady growth of Aviation calls for more and more mechanics-at Good Pay. But you must be properly-trained to hold one of these jobs. At Lincoln you get proper training! You learn to build and repair fuselages, wings, rudders, landing gearsevery piece and part of a plane. You learn about aircraft instruments, how to rig parachutes; you receive complete training in electrical equipment, aerial radio, etc. You learn to service airplanes and to overhaul important types of airplane motors. And remember, you get practical instruction - according to actual factory standards.

Pilots Needed-Well-trained pilots are also neededat Good Pay. We train you to be the dependable type of flyer wanted by air mail and transport companies and others who need pilots. You learn to fly under all conditions. Learn straight flying, cross country, acrobatics, how to make forced landings, navigation, meteorologyeverything you need to know. You fly high and low wing monoplanes, biplanes, open cockpit planes and the large Cabin Transport ships. We qualify you for Dept. of Commerce pilot license tests.

And note that Lincoln is located in the safest flying country in the United States. The flat country for hundreds of miles around offers emergency landing fields everywhere, with ideal year around flying weather.

Part Time Employment is offered students to help pay cost of room and board while training

Positions After Graduation-Our Employment Department is always on the lookout for good positions. We help you locate a Good Pay position after you complete your training

Get Started in Aviation today. Guarantee yourself a Good Pay position by training at Lincoln. Mail Coupon for FREE Catalog and complete information-NOW!

FREE Aerial Radio Course!

A new feature of Lincoln training is a
Special Course in Aerial Radio, regular tuttion
charge \$100. This Aerial Radio Training is
given FREE to Lincoln students who employ
for any of our other regular courses within
the next \$9\$ days.



Lincoln Mechanics' School Building

Two Offers. . . "I have two very flattering pilot offers at substantial salaries."-Evelyn Nicholas.

Airport Manager. . . "I am now manager of Lindbergh Field, Lincoln, Nebr., at a substantial salarv. I attribute my success largely to the Lincoln School."-C. W. Goodman.

\$400 Per Month. . . "My first job paid \$300 per month. Now I earn \$400. The most essential requirement in Aviation is training such as yours."-C. L. Currier.





C. W. Good



C. L. Currier

Ground and Flying School hold highest government approval. Operated under the regular supervision of the U.S. Dept. of Commerce.



Students Working on a Whirlwind Motor

## CATALOG OF 3"

Contains complete Lists reasonable t time employment board while







## HONEST VALUE CANNOT BE GIVEN AWAY

In no other product as in an airplane are flawless materials, sound design and accurate numarisations on vital. The best plane for you to buy, therefore, in the best made—not the chapter. Cost, you know, does not end with the original purchase; it is spread out over the entire life of the plane. The Rearwin "Junior" is not the lowest-priced airplane—although its price is below that of many—but it is a low-cost sirplane. Inexpensive to By—about a cent a mile. Inexpensive to maintain—because of ease of servicing. Inexpensive because it is a long-life product, reducing no a minimum the need of repairs and giving a greater return for the initial investment. If These are qualities of the Rearwin "Junior" because this organization has concentrated it entire facilities on the one plane. It is built of the finest materials that modern its facilities on the one plane. It is built of the finest materials that modern "Ken-Royce" accurately and with pride. It is designed by some of the best brains in the industry. If To give "Junior" owners the utmost in flying pleasure all year 'round we are at the present time perfecting a new accessory, a quickly removable winter enclosure while, when attached, gives the "Junior" all the appearance—inside and out—of a cabin plane. The winter enclosure while, when a tacked, gives the "Junior" all the appearance—inside and out—of a cabin plane. The winter concloure will be stated at the right with those of whatever other plane you have under consideration. A few minutes' investigation now may save you much money and descentent later on.

1595 with 37 h.p. engine

\$1795 with 45 h.p. engine

THE WING

Spars of Spruce, center section leading edge of formed Spruce covered with Birch Plywood, trailing edge of formed sheet duralumin, tips of covered steel tubing, fittings cadmium plated.

#### THE FUSELAGE

Welded chrome molybdenum steel tubing, beautiful and durable finish, large luggage compartment, two place cockpit with individual draft-proof windshields for pilot and passenger, large unobstructed door opening into both occkpits, more weight on the tail than usual to prevent nosing over and to effect perfect landings in high winds.

#### THE LANDING GEAR

Extra sturdy construction; semi-airwheels; shock absorbers; 72-inch tread, which is wider than other light planes' by several inches.

#### OTHER FEATURES

Dual controls, cutaway center section, 12 gallon gasoline capacity, stabilizer adjustable from both seats, reserve power for all kinds of flying.

A. T. C. No. 434

retivities on Fairfax Airport, we are also providing expert flight
price of only \$10 an hour dual. The Rearwin "Junior"
dependable in tight corners. Because it lands slowly,
'hink. It puts them at ease. We have instances here
a dual training in a Rearwin "Junior." The cockpit
It instruction, by permitting easy conversation during
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### orated

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The Rearwin Protected Franchise is worth your investigation. There are valuable territories open with exclusive sales rights, for responsible individuals or organizations. Your inquiry will be accorded prompt and detailed attention.



# uccessive Year!

Warner makes a clean sweep at National Air Races



Transcontinental Handicap Air Derby Santa Monica, Calif., to Cleveland

1st Phoebe Omlie, Warner-Monocoupe 3rd in Women's Division—Martie Bowman, Warner-Inland Sport

3rd in Men's Division—Eldon Cessna, War-ner-Cessna

Speed and Efficiency Contest for Single Motored Planes

1st Eldon Cessna, Warner-Cessna 2nd Walter Carr, Warner-Cessna

Men's Events

510 cu. in. free-for-all 1st John Livingston, Warner-Monocoupe

3rd Vernon Roberts, Warner-Monocoupe 510 cu. in. A. T. C. Race

1st John Livingston, Warner-Monocoupe 2nd Vernon Roberts, Warner-Monocoupe 3rd Peter Brooks, Warner-Monocoupe

650 cu. in free-for-all

1st John Livingston, Warner-Monocoupe 3rd Vernon Roberts, Warner-Monocoupe

1st John Livingston, Warner-Monocoupe 2nd Vernon Roberts, Warner-Monocoupe 3rd Peter Brooks, Warner-Monocoupe

800 cu. in. free-for-all 2nd John Livingston, Warner-Monocoupe

800 cu. in. A. T. C. Race

1st John Livingston, Warner-Monocoupe 1000 cu. in. A. T. C. Race

2nd John Livingston, Warner-Monocoupe

1200 cu. in. A. T. C. Race

1st John Livingston, Warner-Monocoupe

Women's Events

510 cu. in. free-for-all 1st Phoebe Omlie, Warner-Monocoupe 3rd Maude Tait, Warner-Gee Bee

1st Phoebe Omlie, Warner-Monocoupe 3rd Maude Tait, Warner-Gee Bee E

In the 1931 Ford Reliability Tour, Warner-powered planes led all singleengined entries, placing first and second in this classification, winning The Great Lakes Trophy for the second consecutive year.



Warner's achievement this year is particularly brilliant. For not only did Warner with 422 cu, in, displacement, win every event in its power class, but captured as well the 800 and 1200 cu. in. events.

It is important to you to know that the same stamina, reliability and sound engineering essential to the winning of races is inherent in the Warner-Scarab engine that you buy.

Warner performance, day in and day out, is just as dependable, just as consistent as has been Warner's performance from year to year in the National Air Races.

WARNER AIRCRAFT COMPANY, DETROIT, MICHIGAN

WARNER 'Scarab' ENGINES



## Powered by pratt and whitney wasp junior

Now, Texaco chooses Stearman . . . Richfield Oil, Standard Oil of Louisiana, Standard Oil of California and Shell

— already fly Stearmans. Well known mail and express operators, too, have been flying Stearmans for years.

Many prominent sportsmen are on the Stearman "roster." Outstanding values have led to these choices . . .

Choose Stearman for every flying reason . . . the ship itself . . . the Stearman organization backed by United

... the new factory, hub of nation-wide service facilities. STEARMAN AIRCRAFT

COMPANY, WICHITA, KANSAS, Division of United Aircraft and Transport Corp.



# He Lived to Tell the Tale

## Because he wore a Parachute

"I was cruising along at about 100 M.P.H. when all of a sudden I ran into fog—boy, was that soup thick!—I climbed to get above it, but nothing doing, I couldn't try and get under it because I was right in the mountains, so I decided to take no chances and circled to get back out, but I couldn't find an opening in that soup anywhere. Then, I knew I was lost and every moment I expected to see the side of a mountain loom up in front of my nose. So I leveled her off, climbed out on the wing as fast as I could and baled out. Just as my chute opened, I heard the old ship crash into the mountain side. I landed O.K. in a small clearing and, boy, was I glad I wore that chute!" . . .

Of course, this may never happen to you—we hope it doesn't—but if by any chance it does, will you live to tell the tale because you wore a parachute? Don't imperil your own safety and the future of aviation by carelessly flying without a parachute. Remember the hundreds of lives that parachutes have saved and re-



member the Army, Navy, Dept. of Commerce, Air Mail and all Safe Flyers wear parachutes. Switlik Safety Chute, the modern, compact and quickest opening parachute on the market today, is now only \$300 for white silk or \$240 for Pongee silk. Don't delay. Write or wire us today.

Switlik Safety Chutes are Used by the NAVY, Dept. of Commerce, Air Mail and Famous Flyers

Write today for our

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SWITLIK PARACHUTE & EQUIPMENT CO. TRENTON, NEW JERSEY



# Top OVERHAUL

No excessive carbon or scored cylinder walls here . . . valves clean, too. That's what a top overhaul reveals when an airplane engine has been lubricated with Socony De-waxed Motor Oil and fueled with Socony Aviation Gasoline. A minimum of carbon indicates there has been no engine overheating or loss of power.

No wonder Socony Aviation Gasoline and Socony De-waxed Motor Oil are pilots' choice in New York and New England. We gather first-hand experience in fueling and lubricating our own Test Plane. Then our own aviation experts air-tailor these products for flying conditions you yourself encounter. Fly with Socony next time.

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AVIATION GASOLINE

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STANDARD OIL COMPANY OF NEW YORK



## Military Aircraft Experience

## Applied in Commercial Flying



Half a thousand Army planes flash across the sky. Bombers of huge capacity rise from Military depots. Every additional pound carried-every faster mile flown -by Military and Naval planes means advancement in commercial flying. Each type of plane is a different problem. And because Curtiss-Wright supplies

planes of all types to Army and Navy spe-

cifications, Curtiss-Wright is in an advantageous position to meet the constantly expanding program of commercial aviation.

When you own a Curtiss-Wright plane you can be supremely sure that you have the outstanding plane of its class. It is an adventure merely to study the specifications of the latest Curtiss-Wright planes. Ask for illustrated literature.

#### CURTISS-WRIGHT CORPORATION 29 WEST 57TH STREET

NEW YORK CITY



## 10 PASSENGERS & 1000 LBS. FREIGHT



THE Burnelli high speed Transport is not just another airplane. Its development over a period of years has proved a new trend of design for multi-engined airplane advancement. The Burnelli principle heretofore demonstrated in large capacity planes applies equally advantageously to planes of smaller design to meet the present demand of air transportation for higher speeds and more frequent service.

The aerodynamic advance of this design is due to the following, as set forth and extracted from wind tunnel research report of the Guggenheim School of Aeronautics, New York University: (1) The use of airfoil shaped body while providing large internal space contributes substantially to the lift. (2) The body being of airfoil form has a very low drag coefficient. (3) The high wing monoplane gives the most efficient wing and body combination. (4) The design allows for retraction of the landing gear together with a high wing and body combination. (5) The design permits the use of twin engine installation without penalty in additional frontal area.



#### SPECIFICATIONS AND PERFORMANCE DATA

| Span 70 ft.              |
|--------------------------|
| Horsepower               |
| Fuel capacity 197 gal.   |
| Gross weight 12,400 lbs. |
| Weight empty7,685 lbs.   |

| DI MOII IOIII           |
|-------------------------|
| Payload3000 lbs         |
| Crew340 lbs             |
| Gasoline1,185 lbs       |
| Oil 190 lbs.            |
| Number of passengers 10 |

| High speed200 m.p.h.                      |
|-------------------------------------------|
| Cruising speed, with 2/3 power 175 m.p.h. |
| Stalling speed66 m.p.h.                   |
| Climb (retracted)<br>1,450 ft. per. min.  |

10 PASSENGERS

2 PILOTS

1000 LBS. MAIL AND FREIGHT







### AT 200 M.P.H. IN COMFORT AND SAFETY

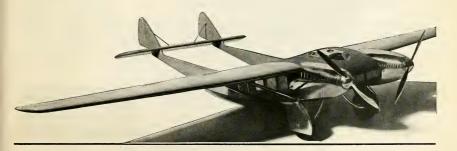
The following fuselage comparison of the Burnelli type with a high speed single-engined design demonstrates the advantages of the Burnelli type as a high speed and passenger carrier. Both planes in the following comparison carry equal loads per horsepower, use the same wing section, have the same landing speed, equal propeller tip speed, and each is equipped with retractable landing gear and tail wheel.

|                            | High Speed<br>Single Engine | Burnelli<br>Twin Engine |
|----------------------------|-----------------------------|-------------------------|
| Horsepower                 | 425                         | 1,200                   |
| Gross weight               | 4,700                       | 13,300                  |
| Frontal area of fuselage,  |                             |                         |
| square feet                | 17.5                        | 50                      |
| H.P. per square foot of    |                             |                         |
| frontal area               | 24.2                        | 24                      |
| Cargo space, cubic feet    | 135                         | 550                     |
| H.P. per cubic foot of     | 0.10                        |                         |
| cargo space                | 3.15                        | 2.12                    |
| Drag coefficient of body   | .00016                      | .00022                  |
| ideally faired             | .00010                      | .00022                  |
| Engine with cooling sys-   | .00030 -                    | .00030                  |
| Lift coefficient of body   | 0                           | .0020                   |
| Equivalent wing area sav-  |                             | 10040                   |
| ing, square feet           | 0                           | 140                     |
| Equivalent resistance sav- | 0                           | 140                     |
| ing flat plate             | 0                           | 1.22                    |
| Resulting comparative body |                             |                         |
| resistance per 100 H.P.    |                             |                         |
| equivalent flat plate      | .305                        | .290                    |
| Percentage of engine power |                             |                         |
| required by body at        |                             |                         |
| 190 m.p.h.                 | 28%                         | 21%                     |
| Engine power required at   |                             |                         |
| 190 m.p.h. per 100 cubic   |                             |                         |
| feet of cargo space        | 88                          | 46                      |

A Proprietory and Patented Design Based on thorough research, construction and operation the ten-passenger, all metal, high speed Burnelli is the first model of this allwing trend of transport design to be developed for production. The economic qualities incorporated represent the concentration of ten years' effort to produce a substantial increase in the high speed, safety, comfort and durability of air transport equipment.

The advanced features of this design have been developed in the CB 16, equipped with retractable landing gear, and the UB 20, built of flat stressed skin, all metal construction. The principal advantages of this design are: 1. Accessible Multiple Engine Compartment, which permits inspection and minor repairs during flight. 2. Extensive Reduction of Head Resistance, an essential of high performance, 3, Reduced Turning Moment on One Engine, assisting flight with only a single motor operating, 4. Fuselage Lift Reduces Landing Speed, indispensable to slower and safer landings. 5. Increased Capacity of Fuselage, provides maximum space for comfort and light cargo. 6. Practical Landing Gear Retraction, in the fuselage, 7. Superior Safety in Operation, as a result of the protection afforded by the engines and propellers being well forward of the pilots and the passengers' cabin. 8. Structural Efficiency and Simplicity; the stresses of the engines, propellers, and landing gear bear no relation to the wing truss. 9. Convertible to Seaplane or Amphibion. The wide fuselage permits efficient twin float attachment interchangeable with landing gear.

### UPPERCU-BURNELLI CORPORATION, Keyport, New Jersey





## For Modern Tool Rooms

Smooth, fast, cool cutting action; the ability to hold its shape and require little dressing . . . that's the Norton "B" wheel, a wheel for the high speed steels and steel alloys ground in modern tool rooms. It has the well known tool grinding features of 38 Alundum abrasive plus the advantages of a new, more stable, more scientific vitrified bond. Available in all the proper grains, grades and structures.



## \$865

## TODAY OPENS AVIATION'S SECOND LARGEST OPPORTUNITY



Only the successful transport pilot stands ahead of the capable line-service master mechanic when Aviation opens the door to

advancement. The transport pilot's leadership is admitted by all. But... and this is important... Aviation recruits its second-largest quota of executives from among its line-service and master mechanics.

Transport training costs several thousand dollars, and is worth every cent of it. But the man who can't afford it now finds in Parks' new Flying Master Mechanic's Course, exactly the preparation he needs for higher positions and better pay. There is a great demand for men with a thorough mechanical training who have had some flight experience, because these men better realize the importance of accuracy and precision in every operation of adjustment or inspection. The operations line service mechanic is more directly responsible for the safety involved in aviation than any other person.

## 48 WEEKS OF MASTER MECHANIC TRAINING, WITH

So Parks adds 20 Hours' Flight Training to its already unequalled master mechanic's course... (exactly the same as the first 20 hours' flying in the Executive Transport

Pilots Course)... gives you a total of 48 weeks under highly capable instructors with the most complete equipment money can buy... and puts the cost at a figure you can afford.

Today the Parks Airplane & Engine Master Mechanic's Flight Course costs \$865. On December 12th it goes to \$965. By coming now you'll save \$100... be a month ahead... and graduate ready for the great opportunities Aviation offers you. Are you ready? Then use the coupon below!



Name

#### AMERICA'S UNIVERSITY OF THE AIR

20 HOURS Flight

10 HOURS Ground

30 WEEKS Airplane & Engine
Mechanic's Course
14 WEEKS Master
Mechanic's Post-

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. all for \$865. Bought
separately these courses
would cost you \$1095.



PARKS AIR COLLEGE, Inc. Section 11-AD East St. Louis, Ill.

Send me "Skyward Ho!" and full information about the \$865 Airplane & Engine Master Mechanic's Flight Course.

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# ECONOMICAL

MAXIMUM economy at part throttle or cruising speed has taken on a new meaning with the development of the Stromberg Aircraft Carburetor.

Two types of *Economizer Systems* contribute to this efficiency on Strombergs.

One is the *Needle Valve* type; the other, the *Piston* type. Both are operated by the throttle; both permit the carburetor to operate at maximum efficiency on a lean mixture at cruising speed and provide a rich, powerful mixture at full throttle.

Economical cruising is one of many reasons why Stromberg carburetors are used on over 95% of the aircraft engines now being built in the United States. Stromberg engineers will gladly help you with your own carburetion problems. Inquiries are invited.

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BENDIX STROMBERG CARBURETOR COMPANY

«SUBSIDIARY OF BENDIX AVIATION CORPORATION»

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1 PAGE 18 PAG

## BIRD success puts you nearly \$1000 to the good



BIRD 3 place 100-hp. Kinner

fully equipped

NOW \$2995

### This plane covered by the famous BIRD CHALLENGE

Nearly \$1000 less in price but not one cent less in quality or performance. Like all BIRD planes, the 3 place, 100-hp. Kinner BIRD at \$2995 invites comparison under the famous BIRD Challenge.

BIRD planes invite comparison in performance with any others in their power range—including planes equipped with rotor vanes, slots, flaps or variable camber wings.

No, we're not selling out! This price reduction of nearly \$1000 is the result of BETTER business...a deliberate move in accordance with our published policy of passing on to you the manufacturing savings made possible by enthusiastic reception of this popular BIRD plane.

Up-to-the-minute in every detail of design and construction . . . a thoroughly proved performer, covered by the BIRD Challenge . . . at \$2995 this plane is one of the best buys you ever heard about.

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The BIRD franchise gives an enthusiastic man something to work for and talk about. The BIRD line of airplanes has wide acceptance and an enviable reputation. BIRD policies and prices mark a constructive step forward in merchandising. There is valuable territory still open for responsible dealers and distributors. Write us at once.



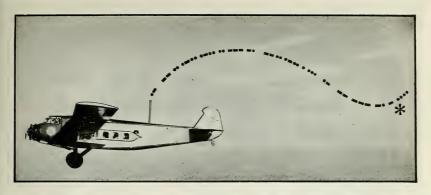
THE SAFE AIRPLANE

BIRD AIRCRAFT CORPORATION
Glendale, L. I. New York



That the new 10-12 place Douglas Amphibion, which has been designed for commercial service, should have satisfied the strenuous tests prescribed for Army service is but an incident. A Douglas builds its planes to meet one standard only . . . a standard of unconditional quality manufacture that makes the Douglas Amphibion the most inexpensive transport to buy and operate. A The Douglas Amphibion is powered by twin 300 h.p. engines, each capable of carrying the full load. The Army rates its speed at 146 m.p.h. A Douglas Aircraft Company, Inc., Santa Monica, California.

Amphibion custom built by DOUGLAS



## United Air Lines Planes Fly \*a Million Miles a Month with B. G. Mica Aviation Spark Plugs

One hundred and fifty-one veteran pilots fly the United Air Lines fleet of more than 100 airplanes powered with 450 h.p. Wasp and 525 h.p. Hornet engines, all equipped with B.G. Mica Aviation Spark Plugs.

On its various routes, United Air Lines encounters every operating condition found on the North American Continent. Its planes fly from sea level to 12,000 feet, while crossing five mountain ranges. Temperature changes run from 40 degrees below zero to 120 degrees Fahrenheit.

The subsidiaries of United Air Lines, Boeing Air Transport (Chicago-San Francisco), National Air Transport (Chicago-New York and Chicago-Dallas), Varney Air Lines (Salt Lake City-Seattle) and Pacific Air Transport (Seattle-San Diego) are pioneers on their respective routes, each having been operating for at least five years. Their choice of B.G. Mica Aviation Spark Plugs, therefore, comes from experience and is the unqualified endorsement of the largest air transport operator in the world in point of mileage flown.



## THE B. G. CORPORATION

Contractors to the United States Army and Navy

136 WEST 52nd STREET, NEW YORK

Cable Address: Golsteco, New York

## Dallas Aviation School and Air College Love Field Dallas, Tex.

A Government Approved School — None Better Anywhere

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Can you imagine flying EVERY day—finishing in record-breaking time—in the best training ships flown—with a field that stays dry, skies that stay clear, climate that's mild and sunny ALL WINTER? This is the BEST school this far South—mighty few other government approved schools are half as well located for winter training. And as for prices-boy, just compare ours with other first-class schools!

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Compare them—you can't match them at any other first class school in

Transport Course \$2500

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H. LUCKEY, Chief Pilot More Than 6000 Hours

training on "FLEETS." These ships cost \$4,500.00 each. No better built. Our INVESTMENT amounts to over \$200,000.00, We own

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Board and room at the field \$10.00 per week. Every city convenience.

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There is still time! We make it worth your while to enroll NOW. Write or wire us at our expense and we will tell you all about it.

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RADIO One of the biggest branches of aviation development—we have it for every student who wants it. New equipment, expert instruction.

Prices Veru Reasonable



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to be as good or better than any other flying school anywhere-and our flying equipment to be second to none in the United States.

Nothing but up-to-date radial air cooled motors used. No old war left-overs.

If you want to learn to fivcome to us. You will get real results—not promises.

Special prices on tri-motored Ford instruction, also for any other course or special number of hours.

Ask any Pilot or Alroort Manager anywhere.

Love Field is one of the biggest, busiest and best airports in America.

We give you real training and real savings—not just promises. Boy-what a wallop you'll get out of your work here and living at Dallas and Love Field!

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#### NOVEMBER

No. 5



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Alex Stöcker photo

The New German tailless airplane designed by Alexander Lippisch and built by the Research Institute of the Rhön-Rossitten Association. Powered with a Bristol Cherub of twenty-eight horsepower, it has a cruising speed of eighty-seven miles per hour.

R AILROADS have progressed through various stages of regulation to the present system of Government super-vision and control. To date aviation has paralleled the course of the development of railroads with striking exactness. Regulation in both cases has been initiated by the states. Do the difficulties inevitable in state regulation of intrastate transportation point naturally to national control for airlines? If so, can airlines expect eventually to be controlled to the same degree as railroads?

THE REGULATION OF AERIAL **COMMON CARRIERS** 

Robert J. MacKenzie

THE history of transportation is the history of human progress. One of its most fascinating features is its ever-changing character and the development of the airplane has caused the most spectacular chapter of all time to be written. Ten years ago there were 6,463 miles of airlines in operation. Now there are 59,243 miles comprising our airline system, over which 143,630 miles are flown every twenty-four hours, carrying mail, passengers, and express with great rapidity to their destination. The rise of this new means of transportation has brought with it many problems, some old and some entirely new. It is the purpose of this article to present a few facts and perhaps stimulate some thought on the problem of Governmental control of these speedy transports.

Practically all systems of transportation have passed through the same stages of development. The airplane, like the others, has passed through three periods and is now in the fourth. These stages may be described generally as follows: first, the inventive or creative period in which the basic theories and mechanical details are worked out. The names of Wilbur and Orville Wright, Langley, Curtiss, Bleriot and many others are written in bold-faced type in the records of this period. The second stage in-volves the application of these machines and inventions to useful tasks within the commercial world, as the steam engine was adapted to use on the railroads and in water navigation, and as the airplane was put to work carrying passengers and other useful loads. The next step in this progression is the formation of systems whereby these instrumentalities are combined into far-reaching networks of communication and transportation operating with a high degree of efficiency and reliability on definite schedules. The fourth period, that of regulation and Government supervision, is the stage in which all forms of transportation now find themselves. Air travel has reached this period by much the same route as have the railroads and, as we shall see, many points of similarity exist in the legislative history of these two systems. Through a comparison of the two, several considerations may be brought to light which probably will receive much attention in the near future

Railway and aviation legislation was first initiated by the states. In the pioneer days of railroad development the public attention was directed toward construction rather than operation. Once the advantages of transportation facilities afforded by the railroads became apparent, the general desire was to provide the maximum mileage as

soon as possible. It was therefore deemed essential to encourage the railroad interests to expand, and laws were passed permitting projectors of railroads to organize and operate in any way they saw fit. This liberal attitude led to a number of evils which resulted shortly before 1870 in a strong public demand for regulation.

The states led off in this movement. It is interesting to note that these early experiments in supervision were aimed chiefly at the reduction of accidents. Commissions for this purpose were established in New Hampshire (1844), Connecticut (1853), Vermont (1855) and in Maine (1858). Experience caused various states to enact stricter legislative provisions as additional problems presented themselves. Finally in 1887 the Federal legislative body passed the Interstate Commerce Act, whereby a Commission of five members (now eleven) was established to administer the provisions of the Act and to recommend needed legislation.

Not nearly so much time or agitation was needed for the Government bodies to pass regulatory measures covering the operation of aircraft. A numbers of states preceded the national Government in this matter (Connecticut in 1911). and as with the railroads the first consideration was "safety" and the protection of the public in general. However before the states accomplished much in this direction, the Air Commerce Act of 1926 was passed by Congress to encourage and regulate the use of aircraft in commerce. The purposes of this act may be classified as follows:

1. The Promotion of Air Commerce, including the establishment of air navigation facilities, collection and dissemination of aeronautical information and the encouragement of the establishment of airports and other aids to air commerce

2. Regulatory Provisions, including the licensing of aircraft airmen, aircraft equipment and all other matters pertaining thereto with authority to make the necessary inspections and ratings to carry out the purposes of the act.

Two-fold purposes are embodied in the Air Commerce Act-the desire to promote the aeronautic industry and to provide for reasonable safety of operation through the promulgation of air traffic rules and the setting of a standard for equipment and personnel. Under the provisions of this act, regulations governing the scheduled operation of interstate passenger air transport services were set up by the Aeronautics Branch which became effective at midnight, May 15, 1930. A study of these regulations reveals that their scope is limited to the safety stage, no attempt

(Continued on page 100)

## I SEE BY THE PAPERS

by baldwell

A SOMEWHAT peculiar writing habit I have dropped into during the past year or two is to turn on the radio and listen to music while I am writing. Possibly this is what is wrong with the writing—I don't know. There's something wrong with it, and it may be that. Perhaps I'm only writing with one half of my brain, and listening to the music with the other half. The whole six of you readers will probably write in and say I'm evidently using the better half for listening—so I'll beat you to it.

Anyhow, I had just begun writing to the accompaniment of a very lugubrious string trio—apparently three old maids with broken hearts formed the trio—when the usual accursed tinkle-tinkle of the N.B.C. chimes warned me that I was in for a change, whether for better or worse I had no way of knowing until the next presentation came bound-

ing over the air waves.

Well, it turned out to be the christening of the American Clipper, the forty-five place Pan American ship, by Mrs. Herbert Hoover, so I very happily stopped writing-I can stop much easier than I can start, I've noticed-and listened to the speeches and the christening. Now, as I resume my pathetic fumbling with the keys of this little Corona (will the manufacturers please make suitable financial acknowledgment of this advertisement?) the great amphibion-or amphibian, take your pick-is in the air above Washington, and I continue to an accompaniment of four Hornets. This is the first time I have written accompanied on the radio by four Hornets, an N.B.C. announcer, and an assorted collection of distinguished speakers, all of whom are using Spanish. That I can make literary progress at all is, I think, an indication of the massive, dual-toned, or possibly partitioned brain with which I am equipped. Still. come to think of it, I did the same thing in the cabin of the F-32, while accompanying the Army maneuvers last spring.

I find it quite possible to write with one side of my brain and listen to the speakers with the other. "We are now flying at four thousand feet, and the city is—" You will notice that I am quite unaffected by the speeches. "Señor Lettuce Tamale will now speak to you and also to his fellow countrymen in Brazil." As I say, I can carry on my notes without letting any remarks by the announcer creep into these pages. "You also heard greetings from several distinguished Americans and Latin Americans." It is inspiring indeed to be able to do that. "This ship weighs seventeen tons, counting the electric refrigerator."

I expect to develop this dual mind talent until I can write and cook a pork chop at the same time. "The hull of this giant craft flashing in the sunlight—" To knock out a sentence and flip a pork chop would be—"We are now passing over—" the height of dexterity. It isn't everyone who can do it, write and cook and listen to the radio, and sew, all at the same time and—"Four million miles a year—seventeen tons—five in the crew."—and not get all mixed

up. "The American Clipper—" and American cooking is fine if you can do it.

Well, that's over and the American Clipper has been followed by a dance band, so the massive Caldwell brain functions with less strain. Listening to that program about Pan American reminds me that I hold the somewhat dubious honor of having carried not only the first load of air mail entrusted to the Pan American Airways, but also the first United States Air Mail ever carried to a foreign country.

The date of this event was October 19, 1927, and the flight was from Key West to Havana. As old Earle Ovington is continually reminding us that he is the first United States Air Mail pilot, I might as well get set up as the first pilot to carry United States Air Mail to any foreign country. And I wasn't regularly in the air mail service at that time, either, though I was later, when I flew the TAC run from Cleveland to Detroit, and the last trip into the middle of Lake Erie.

Pan American had trimotored Fokkers to carry the mail, but the landing field at Key West wasn't ready. I happened to be en route to Santo Domingo in a Fairchild F-C-2, with the powerful Wright J-6 working up ahead, so good old Pink Whiskers Whitbeck, a local menace to the women, wired me to tote that load of mail so they could claim they had started on the contract date. Well, I picked it up and carried it across the Florida Channel to Havana, an hour's flight over the water, thus becoming the first foreign going air mail pilot in the United States. Whether or not this entitles me to free meals in the hotels, I don't know, but I fear it doesn't.

Incidentally, air mails were carried from the United States to ships at sea before that date—Seattle to Victoria, and New Orleans to Pilottown. But a ship is not a foreign country—it's a ship. I add that about those two routes to save every one of you writing to correct me, and my writing back. Rather, I am trying to save myself writing back—I don't mind how much time and postage you spend writing to me.

T O prove that ocean flights are purely scientific ventures, made solely in the interest of aviation, we have the stadio message to a friend from Don Moyle, after he and Allen had landed on one of those islands in the Pacific. The message, as reported by the New York Times, read: "Landed on uninhabited island. Everything all right. Have Frank put publicity man on job. Will be in Seattle Sep. 22."

The Sep. 22 was a trifle previous, but let that pass. Probably they meant Oct. 22. The sentence that delights me is this: "Have Frank put publicity man on job." This is such an integral part of all ocean flights that I wonder the good old publicity man was not on the job long before

(Continued on page 96)

## RAPID AIR NAVIGATION

In the days of sail, when a ship made good but one hundred miles a day, the speed with which a navigator worked to find his position was of so little importance that he could easily afford to take an hour per sight. With the advent of steam propelled vessels of higher speed

the time element became a more important factor. When the navies of the world and the fast ocean liners started ploughing through the seas at speeds of thirty-five knots, frequent positions became a necessity. And now, when planes make from 100 to 150 miles per hour, not only is fast navigation necessary, but it is mandatory.

In the old days the time sight for longitude and the 8° g' sights for latitude were in considerable use. These were laborious and slow. In 1837 came the discovery of the line of position by Captain Sumner, an American shipmaster. Marc St. Hilaire gave to the world his method for finding and laying down on the chart the Summer line of position. And for years this was practically accepted as

the standard method of navigation.

Early in this century, the French, German, and English began work upon precomputed tables, all with the idea of speeding up the work of the navigator at sea. One of the earliest "short" methods in general use in this country was that published by Captain Radler de Aquino of the Brazilian Navy. This was in reality an extremely accurate spherical traverse table. It still has many adherents who, having once mastered its use, find it extremely rapid and accurate. In recent years, with the attention of navigators focused upon air navigation, there have come into being quite a few short and rapid methods of navigation. In this article, the writer will make no attempt to criticize the various methods, giving rather an analysis, together with the practical application.

Finding one's position at sea, no matter what form is used, boils down to the simple expedient of solving a spherical triangle. This can be done easily by a high school student and presents no difficulty. Figure 1 presents the astronomical triangle projected upon the plane of the celestial horizon. In this projection P represents the

elevated pole. Z represents the zenith or the point vertically overhead of the observer upon the earth's surface. M represents any heavenly body. The side PZ is equal to 90 degrees minus the latitude of the observer. Side PM is the polar distance of the heavenly body. It equals 90 degrees minus declination of the body. Side ZM is the zenith distance. It equals 90 degrees minus the altitude of the heavenly body. Angle "t" equals the local hour angle of the heavenly body. Angle "Z" is equal to the heavenly body's azimuth (or its bearing from the observer).

By
Lt. Com. J. Y. Dreisonstok,
U. S. N.\*

Author of Hydrographic Office Publication No. 208—Navigation Tables for Mariners and Aviators In any spherical triangle there are six elements, namely, three sides and three angles. In any spherical triangle if three elements are known, the remaining three elements may be computed.

A. In the case of the timesight we know the three sides:

PZ equals 90° minus the dead reckoning latitude. PM equals 90° minus the declination (which we obtain from the Nautical Almanae). ZM equals 90° minus the body's altitude (which we measure by a sextant).

Hence, it is a comparatively easy matter to solve for "t" the body's local hour angle. Subtracting this value of "t" from the Greenwich Hour Angle (which we get by means of the chronometer keeping Greenwich time) gives

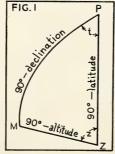
us the longitude.

B. In the case of the Marc St. Hilaire method we know two sides and an included angle. That is, we know the sides PZ and PM and the angle "t" which we figure from the Greenwich Hour Angle by applying the dead reckoning longitude. With these known elements we solve for the side ZM and the angle Z. The side ZM subtracted from 90° will give us a computed altitude which, subtracted from the corrected observed altitude obtained by the sextant, results in an altitude difference or intercept commonly denoted by "a". The angle "Z" gives us the body azimuth. Then from the dead reckoning position, if we lay off the bearing of the body as denoted by "Z" and through a point toward or away from the body equal to the altitude difference we draw a line perpendicular to the bearing line, we obtain a line of position somewhere on which is the position of the ship.

C. In the method of Dr. Littlehales (The Sumner Line of Position, H. O. Nos. 203, 204) there are computed for every degree of latitude, declination and altitude, the values of "t" (the hour angle) and Z (the azimuth). This is similar to the time sight method in which three sides of the astronomical triangle are known. The latitude and altitude are stated at 1° intervals, but interpolations for intermediate minutes and seconds in the value of the latitude and the observed altitude are not necessary because the

Sumner line of position itself interpolates for variations of latitude; and the transfer of this line serves as an interpolation for variations in altitude. The only interpolation necessary is for the intermediate minutes and fractions of a minute in the value of the declination.

D. In the method of Dreisonstok (Navigation Tables for Mariners and Aviators, H. O. No. 208) subterfuge is taken in the division of the spherical triangle into two right triangles by dropping a perpendicular from "Z", the observer's zenith, upon the circle of declination. In Aquino's method this perpendicular is dropped from M to PZ. The former method is preferable, as it obviates at once the need of interpola-



<sup>\*</sup>The opinions or assertions contained herein are the private ones of the swriter and are not to be construed as offical or reflecting the views of the Navy Department or the Naval Service at large.

tion for declination and does away with the numerous precepts of Aquino.

Regard Figure 2. In right triangle I we have given "t" the hour angle and 90-L (the complement of the D. R. latitude); "a", "b" and z' can then be easily found. From the knowledge of b, we easily find "B", since this is equal to the declination plus or minus "b". Therefore, in triangle II with "a" and "B", h and z" are easily found. Z is the sum of z' and z" and thus we may obtain instantly the line of position, knowing the azimuth "Z" and the altitude difference obtained by subtracting "h" just obtained from "h" obtained by the sextant.

The mechanics of the tables are rather ingenious and all values are

precomputed, making it exceedingly simple to handle. The book is very small and, together with the Nautical Almanac, is all that is required. This method is generally used in

the United States Navy, both sea and air.

E. In the method of Pierce (Position Tables for Aerial and Surface Navigation H.O. No. 209) the spherical triangle is again divided into two right spherical triangles by letting fall the perpendicular from M to PZ similar to Aquino. Regard Figure 3. V is the vertex of the great circle. MT or "D" is the length of a perpendicular let fall from M to the local meridian.

There are three tables to the book. Table I gives the value of the local hour angle t' and V for every integral degree of D and every tenth of a degree of declination from 0° to 28°, inclusive, and for values greater than six hours of hour angle or t'.

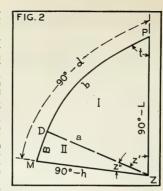
Table Ia gives the value of hour angle t' and also V and D for the principal fixed navigational stars and for values greater than six hours (90 degrees) of hour angle t'. The values of t' and V are computed for the epoch of 1935 and should hold without material error until 1941, when

they will have to be recomputed. Table II furnishes values of altitude and azimuth for each integral degree of D and V'. The rules concerning the application

of the azimuth are printed at the bottom of each page.

These tables offer a speedy solution of great value to aircraft.

F. In the method of Ageton (Note: This method, which was devised by Lieut. Arthur A. Ageton, U. S. Navy, is now in print and will soon be issued by the Hydrographic Office as "Dead Reckoning Altitude and Azimuth Table," H. O. Publication No. 211) the spherical triangle is divided into two right spherical triangles as in Pierce and Aquino by dropping a per-



pendicular R from the heavenly body M on PZ. Regard Figure 3 (a) on the next page.

This method uses the Dead Reckoning Position of the ship instead of an assumed position as in other short methods. It is essentially a logarithmic method using formulae, which are expressed only in secants and cosecants. By arrangement of the one table in the book and by eliminating interpolation, the work of solution has been greatly reduced. This method has one uniform solution for all heavenly bodies under all conditions. and two simple rules. It gives altitudes and azimuths accurate to within .'4.

There is one main table in the book containing parallel A and B columns from 0 degrees to 180 de-

grees. Column A is a column of log cosecants raised to 105 with tabulations for each half minute. Column B is a column of log secants raised to 105 with tabulations for each half minute. Knowing d and t, "R" is found from the relation csc R = sec d csc t. Having found "R," the value of "K" is obtained from the rela-

tion csc K = --. K is then combined with L to obtain sec R

K±L. With K±L and R, he, the computed altitude, is obtained from the relation csc he = sec R sec (K±L) and having found he, Z, the azimuth, is found from the relation csc R

$$\csc Z = \frac{\csc R}{\sec h_e}$$

G. In the method of Aquino (Aquino's Newest Sea and Air Navigation Tables) the astronomical triangle is divided into two right spherical triangles.

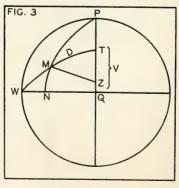
Regard Figure 4. The perpendicular "a" is common to both triangles. In triangle I with d and t we can find "a" and "90-b". Combining b with the latitude we find "90-B" which, with "a" in tri-

angle II, enables us to find "90-h"

and "Z"

Tables are arranged with the value of "a" as the leading ar-The tables are, in gument. effect, traverse tables. Many ingenious devices are employed by Aquino in their construction and they will serve as a standard reference for years to come. However, there are many precepts to learn: The method is difficult to understand and there is used an assumed position whose coördinates are not an even degree of latitude or longitude, making its laying down on the chart a hardship for a flier.

H. The method of Weems (Line of Position Book), an



adaptation of Engineer S. Ogura of the Japanese Navy, is similar to that of Dreisonstok except that: (1) Weems has no solution for azimuth; (2) he makes use of the declination of the point where the perpendicular cuts the circle of declination, which he calls "K."

His book contains the azimuth diagram of Captain A. Rust, U. S. Navy (Retired) and the method of obtaining

the azimuth is graphical.

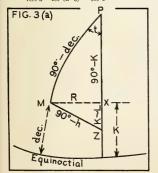
Regard Figure 5. The method is rapid and is admirably adapted for aerial use. With a more exact method of determining the azimuth, the same might be said of it for surface use.

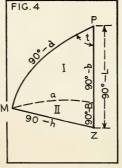
- I. The method of Weems (Star Altitude Curves). This is a very ingenious method, first proposed by Mr. K. H. Beij of the Bureau of Standards, Department of Commerce, and was published in Technical Report No. 198 of the National Advisory Committee for Aeronautics. Lieut.-Commander Weems spent considerable time and money in following out the suggestion of Mr. Beij and the scheme has considerable merit. However, it is applicable only to certain stars and for this reason the aerial navigator must have other means in his possession to find position when these particular stars are not identified or seen; also another method must be used for sights of the sun.
- J. The method of Goodwin (The Alpha, Beta, Gamma Navigation Tables) is a clever conception of the solution of the spherical triangle. Like that of Weems, there is no solution for azimuth. Instead, he too uses the azimuth diagram of Captain A. Rust, U. S. Navy (Retired). The DR position is used for laying down all lines of position. The tables are constructed as follows:

Table I contains two columns marked  $\alpha$  and  $\beta$  which give the values of the natural and logarithmic cosines of the angle from  $0^{\circ}$  to  $90^{\circ}$ .

the values in Table 1(B) and Table II has 10 added to the actual value of the characteristic, in order to avoid the inconvenience of a negative value.

The fundamental equation used is:





and 
$$\frac{1}{\text{vers h}} = \frac{\cos L \cos d}{\cos (L+d) - \cos z}$$
 when latitude and declination are distinct the boar angle  $z = \frac{g}{L} = \frac{g}{g^0 - \text{altitude}}$  where  $z = \frac{g}{L} = \frac{g}{g^0 - \text{altitude}}$  declination

Since the tables only cover hour angles up to eight hours from the meridian they can not be universally used. This is a serious handicap to an otherwise clever book.

A problem worked by the various methods discussed is herewith given.

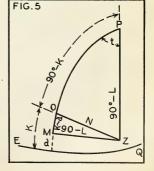
During evening twilight on April 21, 1931, while in position by dead reckoning as follows:

Latitude 42° 51′ .1 N., longitude 50° 04′ .2 W., the navigator observed the star Can. Min. (Procyon) through a break in the clouds bearing 218° (T) as follows: watch time of observation 7h 41m 20s, C-W 3h 01m 15s; chronometer fast 1m 15s on Greenwich mean time; sextant altitude 46° 22′ 20″; index correction (—) 2′ 00″; height of eye 38 feet required the resultant line of position.

By the Method of Marc St. Hilaire



Littlehales Method (The Sumner Line of Position H. O. Nos. 203-204)

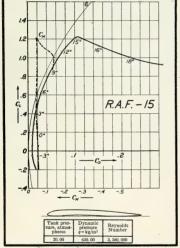


## THE DISTRIBUTION OF LIFT

### Dr. Max M. Munk's Seventeenth Article on the Principles of Aerodynamics

THE question of how the air forces are distributed over the airplane refers to such delicate topics as flight properties and stability characteristics. Only in a very broad sense is this subject open to scientific treatment which gives a clearer understanding, valuable instruction on the procedure to follow and what to expect. The final details must be tried out in flight tests with the practically finished product.

It is always advisable to employ the conception of the aerodynamic center together with that of the center of pressure; with wings and wing cellules as well as with the



Polar of R.A.F. 15 wing section, showing the straight moment curve referring to the 25 per cent point of the chord

entire airplane. The center of pressure is a point through which the resultant of all air forces is passing. The aero-dynamic center is a point, through which the resultant of certain air forces only is passing. These are the air forces produced by an increase of the angle of attack of the airplane, all other things remaining unchanged. The speed is supposed to remain unchanged, as well as the density of the air and the shape of the airplane, so that in particular the setting of the control surfaces must not be changed.

The center of pressure travels in general under these conditions. So does the aerodynamic center. It is defined as a separate point for each condition of flight and for small

changes of the angle of attack. The travel of the aerodynamic center, however, is very small, very often being much smaller than the travel of the center of pressure. For many practical purposes, and chiefly for arriving at broad and fundamental conclusions, the aerodynamic center can, in most cases, be assumed to be fixed. In primitive theory also it is fixed. Experimental evidence should be scanned with the aim to obtain the best location of this fixed aerodynamic center.

With conventional monoplane wings, experience and theory agree very satisfactorily in the existence and fixed location of the aerodynamic center. Primitive theory predicts this point to be located at twenty-five per cent of the wing chord. With reference to this point, the moment coefficient is supposed to be constant.

The study of wind tunnel measurements confirms, on the whole, the existence of this fixed aerodynamic center for angles below the burble point. Its actual location is very close to the theoretical one, and seems to be slightly ahead of it. Twenty-four per cent seems to be the best experimental value, only one per cent from the theoretical one at twenty-five per cent. With some sections it may be nearer to twenty-three per cent.

In plots of the measured air forces, the existence of a fixed aerodynamic center is indicated by the straightness of the moment curve. This is the moment the respect to a chosen reference point plotted against the lift. The slope of this curve gives the distance between the aerodynamic center and the reference point of the moment. If the moment coefficient is plotted against the lift coefficient, the slope (moment coefficient increment) — (lift coefficient increment) gives this distance as a fraction of the wing chord. The increment of the lift acting on that lever arm gives rise to the moment observed. A constant slope therefore, means a fixed center and gives a straight moment curve.

The constant moment coefficient with respect to the fixed aerodynamic center is in theory proportional to the characteristic angle of the wing section. That is the angle between the average direction and the symmetric direction of the wing section. The average direction has repeatedly been defined as the direction of zero lift. The symmetric direction is the direction of zero moment with respect to fifty per cent of the chord. It connects the points of the mean camber line at four per cent and ninety-six per cent of the chord. This theoretical relation is likewise fairly well confirmed by experiments. Calling the characteristic angle \( \preceq \text{of} \) (in radians) the constant moment coefficient is

$$C_M = \frac{\pi \alpha_c}{2}$$
. This gives a distance between the aerody-

namic center and the center of pressure equal to

$$C_{M} \div C_{L} = \frac{\overset{\sim}{\sim}_{C} (1+2a)}{4 \overset{\sim}{\sim} a}$$
(Continued on page 97)

## COMING OUT OF IT

### By DON ROSE

T should be put on record, I think, that the depression has done no serious damage to our national sense of humor. I do not particularly refer to the current epidemic of pitiful wisecracks concerning Wall Street and other economic institutions, which can be heard and seen in places of alleged public entertainment. I am thinking rather of the mood in which people of no importance, even as you and I, are taking it on the chin, the snoot and in the solar plexus.

It has become almost a conventional greeting to say to your neighbor on a fine and frosty morning, "Well, old man, how's your bank?" And if it happens that he hasn't got a bank any more, he doesn't break into tears about it. He grins at you cheerfully, in the manner of a man who knows the worst and finds it not nearly so bad as he expected. And that grin and the mood that goes with it are beginning to spread across the face of these United States, which is a most unexpected consequence of an economic avalanche.

In times like these there must be aid and comfort given to those who are really out of luck. There are campaigns for unemployment relief, community chests, welfare drives and collections in churches, cabarets and on the street corners. There are football games, prize fights, air meets on Long Island and Alime Semple McPherson Hutton in Boston, all putting on a show for sweet charity's sake. There are efforts to invent work for the workless, as bricks were once made without straw.

The average American is a forgiving, forgetting and incurably optimistic creature. He knows, moreover, the important elements of economics, and that faith in futures is one of them. He finds it easy to understand that a dollar bill has no value, except on the supposition that somebody, some day and somewhere, will replace it with hard cash. He knows that the value of a thing today depends pretty much upon what it will be worth tomorrow. He understands that such values are intangible, but absolutely real. He has faith, in fact, in dividends to come for today's effort and industry. It has been born and bred into him since America was Indian territory.

So it is unlikely that the troubles of two or three years will spoil him permanently as a business prospect. And there lies the real hope of our economic recovery. There lies the hope of aviation, which has lived rather steadily on a diet of faith, hope and charity since the world first put on wines.

For now that we are all become "economics-conscious" it is safe to say in public places that there was hardly ever a major industry which pinned its faith to the future so earnestly as aviation. It has been looking ahead so long, indeed, that some of us are a little cross-eyed with the effort. It is my purpose to maintain, however, that this sort of optimism is not only legitimate but fundamental to any sort of success. It has been proved, I think, by the disintegration of the depression that nothing but a forward-looking faith can cure what has been ailing this country for two years past. Nothing else can restore the substance and

worth of our institutions, financial and otherwise. And nothing else, therefore, can be quite so wholesome for an industry which has few other defenses to depend upon in hard times.

Let us, if you please, become somewhat specific. When a new airport, for example, is projected, it has no real assets except the idea in back of it. Its promoters buy some land and possibly put a fence around it. It is still land, and worth no more than was paid for it. But because a reasonable number of reasonable people believe that a reasonable number of pilots, planes and transport companies can be persuaded to make use of it, money is collected from here and there to equip it for business. The equipment is expensive and is peculiarly unsuitable for any other purpose whatever. Its net and intrinsic worth, therefore, may be trifling compared to its cost, so that there really remains nothing much to an airport except the land on which it lies.

But if it is a good airport and well placed, it has another immense and immeasurable value. It has a future. From that future, which belongs to nobody, it borrows a large proportion of its real worth. Because it has a future, the stockholders are patient with the scraps of paper which are supposed to yield them dividends and usually don't. Because it has a future, other industries come around and wait for their pickings. Because it has a future, the public is respectful to an enterprise which might otherwise seem a serious waste of money and effort.

The same is true of most transport companies, which labor mightily to please the public without requiring the public to pay the full price for the service. It is true of those who provide the pay roll for the design department of the aircraft factory, not for what they get but for what they hope to get. It is true of those who pioneer new trails of the air or wear out their brains on new inventions. There is very little nourishment in these things at the moment, but the future will pay the bill. Or so we hope and believe.

If this business policy of faith in the future were a private habit of aviation, there would be good reason to doubt its soundness. Some time ago it was said in so many words that aviation was all wrong because it was founded on hopes deferred and profits postponed. But the depression has taught us, if we have been listening and learning, that this is true of all the world's important affairs. Since men first tried team-work, it has been impossible for them to live hand-to-mouth, as they did when they dug their dinner from the ground or shot it off a tree or pulled it out of a fishpool. They live and work and do business in the expectation of tomorrow. They save for tomorrow, they build for tomorrow, they propose to pay their bills tomorow. They work hard today, so that they can rest tomorrow. They borrow today, intending to repay with interest from the earnings of tomorrow. They plan today, trusting their dreams to come true tomorrow.

When the world at large lost faith for a while in tomorrow, it fell into the depression with a dull and sickening thud. And now that the mood of great expectations be-

(Continued on page 93)

## AIR—HOT AND OTHERWISE

### Flying Ahead

### Rendering Useful Service · Period of Adjustment

#### Frank A. Tichenor

P EOPLE, as a whole, in the United States, have a limited understanding of what progress is being made in aviation. Hearing that some plants have been closed they are surprised, wondering if, after all, the new means of transport is all wrong. As a matter of fact some of the plants which have closed were ones which never should have been opened.

Today the industry is stronger than ever. It's a good moment to use in considering some of the reasons why this is so and at the same time to review some of the mistakes which have been made.

Overenthusiasm swept us in 1927, when hundreds of new aviation companies sprang up overnight and a few of the older organizations, through mergers and expansion, reached points at which it was impossible to pay dividends upon their much too numerous shares. Such mergers and expansions brought unnecessary expenditures in the construction and enlargement of plants, in the purchase of new machinery, in the acquisition of high salaried executives, many of whom were unacquainted with the industry and because of lack of experience, were able to deliver little real service. That expansion was based on hope, not on a study of the market. In 1927 several companies had been making profits-limited, but profits. In the madness of that year these were dissipated in creating new designs unsuited for the existing market and designs for which no market was to be had.

These are hard times in every line of industry and it would be unreasonable to expect that the new and not very carefully organized aviation industry could continue undisturbed upon its way through them without a single nose-dive, while older and more experienced industries have been numerously crashing.

After these hard times come to an end aviation will be found to have rendered useful service to the whole business situation. Its rapid delivery of checks to people in sore need of money, its rapid delivery of products when it has been necessary to buy closely and keep stock and costs down in order to survive, have been advantageous in innumerable instances.

The fact that business has discovered this will react favorably upon aviation, creating healthy conditions among operators. Reduction of air passenger rates, which seems to have begun, will sell air travel to almost all who try it once. This, in turn, will create new and better aircraft which, in their turn, will produce favorable results upon other new customers for reasonably priced, safe speed. As efficiency increases through experience, economies will be instituted, and these, playing their part in the various beneficent cycles, will help toward the further lowering of operating costs.

Plant, in the form of lighted airways and airports, already has been extensively established and will have a steadily constructive effect on business, as the completion of facilities had on a railway business in its day. When political influence ceases to play any part in the routing of air mail contracts, when the natural tendency of administrative powers to give to those which are most insistent ceases to be politically stimulated—and this time is now not far away—things will better. We are not so sure that the best interests of the air mail operators always have been served even by the demands which they, themselves, have made. New knowledge will adjust such matters. Many adjustments will come through experience.

The whole system undoubtedly will go through a course of change and evolution, as air mail, steadily growing because of the continually increasing measure of its benefits to the people, gradually achieves almost complete pre-eminence among the arts of communication.

When the depression came along in 1929 most of the newer organizations closed down, after shivering briefly in the chill of exceedingly unfavorable financial weather, and, naturally, the activities and reorganizations of the older and more solid companies were curtailed.

The lessons of this period have their definite value and those who remain at the head of today's going concerns, (having been able to adapt themselves to the new conditions) are men proved by trial, who have overcome obstacles confronting both themselves and the industry. They will overcome other obstacles which may come and win from difficulties triumphs for the industry, for these men now have that skill which comes only from experience. Almost any novice can be a good enough fair weather pilot, but it takes skill to be a worthy pilot in adverse weather. Because of the dearth of trained men some companies, solidly intent upon worth while performance, went to the Army and Navy for executives. The Services are not always the best schools for executives, as a government employee is not frequently confronted with problems of markets, choice of proper personnel, costs, promotion opportunities, etc., found in the most competitive field of business and industrial enterprise.

Despite all these handicaps, which, great as they have been probably are not greater than those met in most new industries, American aviation has sped ahead in all its important branches. Airplanes are now flying over 150,000 miles daily in the United States, covering 50,643 miles of airways of which 16,000 are lighted for night flying. In the one month of August the number of air passengers increased 9,000 over the preceding month. Air mail volume is growing steadily, its total now approximating nine million pounds a year carried by over 600 planes worth about twelve million dollars. Four years ago 128 planes were engaged in air mail service, their value being less than one sixth as much. The increase in air express, which is comparatively new, amounted to 72,208 pounds in July and 132,296 in August. Going some!

(Continued on page 96)

## EDITORIALS

#### **ECONOMY PROGRAMS**

HAT does the President's economy program mean to the aeronautical industry?

That the right kind of an economy program in national defense is essential to the financial well-being of the nation cannot be denied. But it should be one which cuts out unnecessary expenditures—not one which eliminates from our national defense its most essential factors.

The closing of a lot of useless Army posts would save millions of the taxpayers' money now spent for no worth while purpose whatsoever. Most of these posts have been for generations mere political contributions preserved only because the states wherein they are located have sufficient political power to put through appropriations year after year. One half the sums thus wasted, if devoted to aircraft, would make the nation safe.

We could also eliminate one-half our cavalry and still have too much for practical purposes. It now produces a first class polo team and a blue ribbon now and then at the horse show; but those things might be cut in half without a national disaster. Half its cost devoted to air-craft would go far toward-giving us what we need.

Here is the sort of economy that the President might recommend with the certainty that he was suggesting something worth while. If one-fourth of its proceeds were spent in air development we would forthwith become first instead of fourth among the air powers of the world. And how all this would please the taxpayers!

#### THE MATTER OF MAIL RATES

POSTMASTER GENERAL BROWN will ask Congress for an increase of postage rate. This very properly will be sternly combated by many affected interests, that interest most seriously threatened being the education of millions of our people.

Anyone who stops to think will realize that our mail facilities are our greatest educational institutions. Post-master General Brown could increase his department's revenue by a directly opposite process—through reduction of the air mail rate instead of the increase of any postal rate. But instead of this Mr. Brown is considering its actual increase, a procedure which, in the opinion of careful thinkers, and in that of every enlightened student in the industry itself, would be literally disastrous.

No, Mr. Brown. You are looking at the situation from the wrong point of view. A rise in the American postal rate would be an attack upon America's development. A rise in the air mail rate would be an attack upon, not a favor to, the aeronautic industry. Decrease the rate and carry not twice but many times as much air mail, thus tremendously serving the American public by giving it the fastest possible mail service at the lowest possible cost.

#### SUPPORT REPRESENTATIVE WOOD

REPRESENTATIVE WILLIAM R. WOOD, of Indiana, one of the ablest men in the House of Representatives, is Chairman of the Committee on Appropriations and naturally a very busy man. But valiantly he is fighting as champion of our national military aviation and takes great pains to try to educate the public on the question.

"The next war will be in the air," says he. "We must maintain our aviation defense in top notch condition. Battleships will take little or no part in the next conflict. They are obsolete."

Yet so-called patriots are fighting tooth and nail in Washington preparing an effort to force a vast Naval spending program upon Congress during the next session, and the number of supporters of Congressman Wood, while by no means to be ignored, is much smaller than it should be.

It is to be hoped that the aviation industry will back up Congressman Wood, helping him to educate the other members of his committee and Congress in general to the necessity which plainly exists for additional appropriations sufficient to make our Army and Navy Air Forces comparable with those of other first-class powers.

#### THE "AKRON"

A SENSATIONAL article appearing in one of New York City's leading afternoon newspapers makes serious charges against the Bureau of Aeronautics in the acceptance of the dirigible Akron, stating that it does not come up to contract specifications.

Congressman LaGuardia, who is not prone to lavish praise on Governmental departments and who in the course of his official duties has criticized the Navy Department as much as, if not more than any other member of Congress, proved in a public address that these statements were not founded on facts and were made without a thorough investigation of the real conditions.

The designing and building of an airship of this size and type in the present stage of the art is an engineering undertaking of vast magnitude and it would be a miracle if on completion every item and every element going into the airship's construction should be found to be 100 per cent.

Provisions were made for guarantees of general airworthiness, total weight and speed; and penalties were provided for failing to meet these requirements.

Provision is also made for a six months' guarantee during which any defects or deficiencies which develop are to be corrected or repaired to the satisfaction of the Bureau of Aeronautics at the expense of the contractor.

The building of airships is still in its infancy and practically every new ship is an experimental job, based on the successes and failures of the past. This work must be done in order to know what value these ships can have in our national defense and commercial transport. It is being carried on efficiently by Admiral Moffett and the Goodyear-Zeppelin Corporation. They should have the full cooperation of everyone interested in American aeronautics. It will cost less to determine lighter-than-air merits and demerits now than if we wait until we have another war.

## ARE EUROPEAN AIRLINES BETTER THAN THOSE OF THE UNITED STATES?

A MERICANS traveling in Europe still cling to the mistaken idea that European air transportation is superior to their own. As a matter of fact, with the possible exception of more attention to passen-

ger comfort at the larger airports, such as Croydon, Le Bourget and Tempelhof, American air transportation is years ahead of European operation. This statement applies to speed, airway equipment, safety,

air mail transportation, passenger comfort in flight, equipment maintenance and line supervision. In respect to cost of air travel and pilot personnel there is little difference between American and European systems.

American passenger air transport exceeds the European air schedules by at least fifteen to twenty miles per hour. Adding to this the fact that refuelling and transportation to and from airports is very much slower in Europe, one soon comes to the conclusion that air travel in Europe is a very leisurely affair. The fundamental reasons for this difference are, of course, the differences in train schedules, the European trains operating slower, and the fact that the distances traveled in Europe are, generally speaking, not so great. In both Europe and America air transport must show an advantage over train times, but American air transport has to compete with faster train schedules, which fact has resulted in faster air schedules. The American view further recognizes the fact that the greater the speed the greater the advantages in air travel, and consequently, as new equipment is purchased from time to time, insists on greater speed requirements. There seems to be no tendency in Europe to better the schedules, and one hundred miles per hour will be fast for some time to come.

The equipment of airways in America is also superior to that of Europe. America now has a system that covers the entire country, whereas in Europe there is practically nothing. A European airway is merely a route along which

#### Paul Goldsborough

Vice President Aeronautical Radio, Inc.

Mr. Goldsborough recently returned from a 3,000-mile air journey in northern Europe, making a study of European methods in air transport. Drawing on his aviation experience, which goes back to 1917 and includes the presidency of Northern Air Lines, now a part of American Airrays, he makes in this article detailed comparison of many significant hauses of European and American transport sustems.

planes fly. The only aids to navigation are some degree of weather collection and a radio direction finding system; there are no emergency fields maintained, and few beacon lights. The fact that these aids do not exist has

retarded night flying so that little takes place, and none with passengers.

European operators apparently are inclined to load their planes with the maximum load, whereas in this country a nice balance has

always been maintained between load maneuverability and safety, and the loads have been kept low enough so that both plane and pilot are never at a disadvantage. In Europe, payload seems to be more important than speed.

Compared to the American air mail system with its twenty-four hour delivery from coast to coast and its thousands of pounds of mail carried daily on schedule, Europe has nothing. A small sack of not over twenty-five or thirty pounds was the largest load I saw on any of the main routes. The European rates are higher and air mail is practically unknown to the general public. However, more light weight express is carried between the principal cities, consisting mainly of perishable goods. This express is loaded directly in the passenger cabin. A curtain can be drawn to divide the cabin into passenger and express compartments.

Passenger comfort has always been an important consideration in this country. In a European plane the passenger, once he has paid for his ticket and taken his seat, is apparently forgotten by the operator until the plane arrives at its destination. At no time during any flight I made was any member of the crew in the passenger cabin. No meals were served in flight, but lunch stops were made en route, and the airport restaurants are universally good. Strip maps of some flights were sold, but no reading matter was available, probably on account of language difficulty.

One impressive feature of European air transport is the

size and in particular, the conveniences of such airports as Croydon, Hamburg, Tempelhof, Le Bourget—although the volume of operation from these airports is much less than from the leading terminals in this country. It is possibly this attention to passenger comfort at air stations which influences the American traveling in Europe in favor of European air transport.

With regard to pilots, maintenance and line supervision, the methods of Europe and America offer interesting comparisons. So far as day flying is concerned,



An Arado, powered by a Pratt and Whitney Hornet, on the Luft Hansa line

which is the only kind observed in Europe, the European pilots seem to be equal in technique to the American. Possibly they rely to a greater extent on their motors than do the Americans. The average age of the passenger pilots seems to be between thirty-two and thirty-five years.

It is difficult to generalize on European maintenance of aircraft and motors on account of the great divergence between the various lines. On certain lines the maintenance is considered by even the layman to be very poor. The reputation of these companies for careless maintenance is widespread; in America such an airline would find it very difficult to secure passengers. The shop methods are about the same as in America. The period between motor overhauls is shorter than obtains here. At the present time a certain American motor is regarded as the last word in reliability and one company manager told me his company had recently standardized on that type. Replacement of equipment is much less frequent than in America. I rode in transport ships on certain lines that had been in use since 1925.

There are two kinds of line supervision. One is government regulation. Government regulation usually consists of an outlining of standard practice which experience has shown necessary. Its primary object is to insure safety in flight. In addition to the government regulation, most air transport companies have their own rules and regulations, in many cases more stringent than the government's, depending largely on the company's feeling of responsibility to the public. In America we are fortunate in having only one set of government regulations, intelligently enforced.

We are also fortunate in that the entire industry speaks the same language, and thinks along the same lines. In Europe, each country (and a four-hour flight may mean landings in three or four countries) has its own set of regulations, resulting in much confusion. While it is difficult on a short visit to form an opinion of the individual control of the various lines, I did see considerable evidence of looseness in operation and I think it safe to say that the lines are not supervised in Europe with the close attention to detail that has become so evident in the United States during the past two years.

The American method of radio communication between planes and ground is superior to the European system, but because of the difference in operation it is difficult to make definite comparisons. In Europe all communications from ground to aircraft are conducted from stations owned by the government in whose territory the station is located.

The communications are all conducted on long wave lengths and only two channels for all of Europe are used. This results in jamming, at times when the radio is most needed. Except in Germany, radiophone is used exclusively. Trailing antennae, unshielded motors and unbonded ships are standard practice. Radio direction finding has been developed to a satisfactory degree.

To insure equal service to all nationalities, all radio communication between ground stations and airplanes is conducted under international regulations to which the various interested governments have subscribed. The equipment does not compare in refinement and adaptation to aircraft with the apparatus now in use in the United States. In this country, in addition to the Government's radio aids to navigation, which have been developed to a much higher degree than in Europe, the transport companies have installed along all their routes their own high frequency (short wave) radiophone systems, which have been in operation for the past year. With this system the pilots are never out of contact with ground personnel, especially trained and responsible in a large measure for the safety of the craft with which they are in contact. Air transport in Europe has nothing like this and it is doubtful if it ever will because of government restrictions on privately operated ground stations. The only interest the Europeans have displayed in high frequency for aircraft has been in connection with long distance flight to colonial possessions in which the planes communicate with the bases of operation over great distances, using much higher frequencies than used in the United States.

Navigation instruments are practically the same in European and American transport ships, but the arrangement of the instrument board in the American plane is usually better.

Operation of airports offers interesting comparisons. Croyden, the principal air transport terminal for London, is used by the French, British, Belgian, German and Dutch lines. It is only thirty-five minutes by bus from Piccadilly. There is no centralized passenger pick-up in downtown London, each company operating its own service, some using hotels as a starting point, others using their own offices. There is a central building at the airport used as a waiting room and for traffic offices. The waiting room takes the form of a lobby and grouped around the lobby are booths with counters. Each line has its own booth with traffic representatives attending. Back of the counter are private offices for the traffic representatives. Executive offices are on either the second or third floor. In the center of the lobby or waiting room is a pedestal with clock faces, showing the arrival and departing times of the various lines. A simple board showing this information would be much easier to understand. On one side of the lobby is a map of the territory covered by the lines radiating from London, with provision made to show weather conditions prevailing over the territory. The system used is complicated and conveys little information to the passenger even if he has time to study it. I question the (Continued on page 88)



Hornet-powered Pilgrim used on some routes operated by American Airways, Inc.

## RIGINIZA ARLITIES

HE only counterpart of Ben Hur in aviation is Victor E. Bertrandias, assistant general sales manager of the General Aviation Manufacturing Corporation. You know who Ben Hur was, don't you? He was a Jewish lad whose real name was Bennie Hurstein, but he shortened it down to Ben Hur when he went to work for Ringling Brothers and Barnum and Bailey's Combined World's Greatest Shows, driving the four horses in the chariot race. He always drove the white horses and came in first. When I was a boy I used to wonder which were going to win, the white horses or the black horses. But now I know the white have to win, because white horses are more popular with the crowd. Even chariot races are fixed.

Victor Bertrandias drives a whole chariot race of his own, only instead of having his horses hitched up in line he has one pair in front and the other pair behind. And in-

> stead of hauling a little cart, with Victor standing up in it waving a whip, these four Hornets drag along an affair not quite as big as the main tent but somewhat larger than the side show. It's called the Fokker F-32 because if

you get 32 paid



passengers each trip you might break even, but if one misses the boat you run at a loss. It was built in what used to be called by

our financial men "The New Era of Business" because never before had so many brand new suckers entered the stock market where they were promptly erased.

Victor Bertrandias, who now drives this aerial chariot race I've mentioned, started off with the late Art Smith in 1915 at the Panama Pacific International Exposition at San Francisco. He toured the United States and Japan with Art, as mechanic and race driver-for in those good old days the big show with an airplane was to race it around a dirt track immediately above an automobile. First the automobile would forge ahead. then the airplane would catch up to it, almost pass it, drop back, catch up, drop back, and remain sort of under dog until the last lap, when it would edge past the speeding automobile and come in ahead on the home stretch. The crowd used to go wild. Sometimes when the engine wouldn't start, they'd go even wilder, and try to tear up the airplane under the belief that it was all a fake and couldn't fly.

Well, after two years of this sort of thing. war came as a real vacation for Victor, the



hard working race driver, mechanic, pilot, and handy man, who had soloed at San Mateo, California, in May, 1915, which makes him an Early Bird. He became an engine instructor at the Hispano Suiza factory at Bois Colombun, France, and later was assigned to the 94th Pursuit Squadron and departed for the front. This was the famous "Hat in the Ring" Squadron commanded in turn by Major John Huffer, Major Raoul Lufbery, Captain Eddie Rickenbacker and Major Reed Chambers. With this squadron Bertrandias established a record for himself, was commissioned in France, and returned to the States in 1919.

The low point of his career was reached when he got back, for the army sent him to Hoboken, New Jersey, a place situated opposite New York as a contrast. So that's what he got for fighting for his countrya berth in Hoboken! There he was appointed director of ambulance service under General Shanks, Commanding General of the Port of Embarkation, and superintended the evacuation of 75,000 sick and wounded. Whether they got sick in France or got sick looking at Hoboken, I don't know. Anyhow, Victor was in charge of the ambulance service that moved them on to happier burgs.

In October, 1919, he was commissioned First Lieutenant in the Regular Army, posted to the Air Corps, and sent to the Army of Occupation at Coblenz, Germany, a beautiful little city on the Rhine. I was at Cologne, a few miles down the river, at the same time. I don't know what Bert was doing in Coblenz, but in Cologne I was drinking wine. Of course, I was occupying the territory, as a soldier should, but mainly I was drinking wine. So was all the rest of the army, except the part that was drinking beer. So far as I can recall, if the Germans had decided to throw out the various Armies of Occupation, all that we bold occupiers could have done about it would have been to sing "Sweet Adeline." That was some army, lads. I wish I was back in it, occupying Cologne any time after six p. m.

In 1920 Bertrandias returned to the land of partial drought, and was stationed as Engineering Officer at Carlstrom Field, next Kelly and then Langley Field, where on Nov. 7, 1924, he made a world's seanlane record for 1,000 kilometers, which was not broken for two years. Then he was assigned to the Engineering Division at McCook Field and was made Chief of Inspection Division, until the formation of the Materiel Division, Wright Field, when he was made Chief of Inspection. During the Sesqui-Centennial at Philadelphia he was given leave to operate the Philadelphia Air Service for the Mitten management of the Philadelphia Rapid Transit Company, operating trimotor Fokkers between Philadelphia, Washington, and Norfolk.

Upon the termination of his leave, Bertrandias was assigned as Western District Air Corps manager, in charge of aircraft production at the Douglas and Boeing plants on the West Coast. In September, 1928, he went to Europe to inspect aircraft factories in England and France. A year later he resigned from the Air Corps and joined his old war-time friend, Captain Eddie Rickenbacker, with the former Fokker Aircraft Corporation of America, now the General Aviation Manufacturing Corp'n. His chief duty is to act as assistant general sales manager, but on the side he acts occasionally as a herder of stray newspaper men, magazine writers, photographers, and other lowly growths who infest such affairs as Air Corps maneuvers and air races. I shall not soon forget the very delightful flights I had with Bert and William De Wald at last summer's air maneuvers in the F-32. That's a vacation I'd be glad to take each summer

HE gentleman who resembles director waiting to receive his twentydollar gold piece for attending a directors' meeting, actually is a director. You



James B. Taylor, Jr

can tell by his watch chain. All directors, except movie directors, have watch chains and large gold watches. Watch chains have practically ceased draping themselves before the stomachs of us ordinary more tals, but directors cling to them and an expectant look

as though they were waiting for the general manager to rush in with the yearly reportand what a report he's been rushing in with during the past two years! This expectant director is James B. Taylor, Jr., hoping

for the best but expecting the worst.

Not only is Taylor a director, but also president of Air Associates, Inc. And to indicate the progress of aviation, I'll just mention that the engraved stationery on which he writes to me has 535 Fifth Avenue, New York, crossed out in red printing ink, and Garden City substituted. Air Associates is back to the fields with the rest of them. Well, you're not alone, Mr. Taylor-I used to live on Riverside Drive, myself, and now I'm at Malaria-by-the-Sea, Long Island, I guess we people were too near the big bankers and brokers when we were in town. We're safer out in the country,

Taylor is an old navy man, joining the Naval Air Service in 1917, fresh from Princeton, where he had imbibed at the fount of knowledge presided over by the sainted Woodrow. The serious expression Mr. Taylor wears even to this day may be attributed to staring, during his impressionable youth, at the solemn Woodrow during that worthy's pedagogical days. He trained at Bay Shore, then went to Washington where he was attached to the Plans Division of the Bureau of Navigation, doing experimental work chiefly with relation to shipboard and deck landing machines. Here he spent the war very comfortably, directing affairs. Even at that early stage of his career, you will notice, he had become smart enough to direct others instead of doing it himself. It isn't generally remarked, but that really is the essential to success in any line: Make others do it, direct them, tell them how-but never do anything yourself or you lose caste.

After the war this confirmed director went into the metal stamping business, and was at once made president of Upressit Products Corporation. That's a good name for a suit-pressing establishment, by the way. He kept up his naval activities, is still in the Naval Reserve, ready to direct things again in the next war, and has always kept up flying. He's a confirmed joiner and belongs to a vast number of things that I'd write down here only in the first place I'm too tired, and in the second place who cares, anyhow? It was in 1926 that he and Haven B. Page talked over the forming of a sales company, and in 1927 organized Air Associates, Inc., of which Mr. Taylor became president in August, 1928.



T IS very seldom that I get a chance to take a crack at one of the late enemy in these columns, but here's Ernst Voss whom I surrounded and captured with the assistance of Marian Trace, secretary of the Ernst Voss School of Aviation in San Bruno, California, and herself a pilot.

Take a good look at Ernst as he appeared in the trappings of a German war pilot, complete with medal, in the year 1916, and you'll wonder how any of the Allies ever had the heart to go up and try to



Ernst Voss

there was to any of the business. The psychopathic old cripple who ruled Ernst's country by Divine Right is now a wood-chopper, and the equally lunatic slogan that we shouted as we dashed into the fray has long since passed away, even as a vaudeville joke. I suppose Ernst, like myself, often wonders what it was all about, and why any of us were simple enough to take any stock in the Sacred Causes we were battling for. However, at twenty one is easily stirred when the war trumpet toots: the patrioteers work shoulder to shoulder with the profiteers and we mental infants think it's all very splendid.

shoot holes in that

innocent youth. I'm

glad now that we

failed to hit him;

and doubtless since

he has met the lads

over here who may

have taken pot

shots at him Over

There, he has won-

dered what sense

Ernst arrived on this earth without a uniform, wailing feebly as infants do. If he could have looked ahead, he might have wailed all the harder. But not being born with foresight, he merely wailed after the normal manner of infants, grew and kept on growing, went to school and learned as little as most of us do, and thus was fully equipped to become an officer when his country called.

This sad event of being born happened in Mecklinburg-Schwerin, Germany, on December 12, 1895. I say sad event because he was the twelfth Voss to appear in Mecklinburg-Schwerin, and therefore faced a childhood devoted largely to growing into things that other young Vosses had grown out of. That uniform was probably the first suit that hadn't been handed down to young Voss from the next Voss in line. The war to him doubtless commemorates his first entrance into the new suit phase of existence. No wonder he looks as though he had just found life to be earnest and worth while.

He was still eighteen when the war started, so he enlisted with great enthusiasm in the infantry. To get him started gently, the army sent him to the Russian front where he found the greatest danger to be starvation. Not only he, but his whole company displayed early indications that they would become pilots, for they got lost and were cut off from the rest of the boys, including the commissary department. Voss wandered around somewhere behind the Russian lines, living off the frozen country which supplied him only with frozen carrots, mangel wurzels, and other refrigerated delicacies. During these wanderings his interior arrangements became so deranged that by the time he finally got through the Russian lines and back to the German armyguided solely by the odor of limburger and beer on the evening breeze-he was ready for the hospital. Here he lay for three months pondering on the glories of warfare and its effect on the digestive tract.

However, being naturally a bright boy. those three months of heavy thought brought him to the conclusion that the worst possible way of going through a war was to walk, so when he was discharged from hospital he enlisted in the German Flying Corps.

In August, 1915, Voss entered the D. F. W. School at Leipzig, completing his training, received his commission and that new suit and started off for Flanders. There he flew Albatrosses and D. F. W.'s, mostly over the Somme area, and collected this medal, which Marian Trace says now is reposing in a cigar box full of paper clips, thumbtacks, and other oddments. She describes it as being too large for a lapel pin, and too small to serve vegatables on. I have two somewhat like it that were tossed to me while I was in the war, and one that Edsel Ford gave me for surviving the speeches and roast chicken encountered on the first Ford Tour. I don't know what to do with mine, either.

You know, it is only a question of time when education,-universal and liberal education-will do away with armies, and navies too, along with fighting air forces. Mankind eventually, though not in our day, will become too wise to fight, too sensible to indulge in a conflict from which no one but the profiteer emerges victor. However, as I say, that is a long distance off, so in the meantime perhaps it is just as well that simple souls like Ernst and myself should in our younger and more vigorous years don standardized clothing and go forth gleefully to smite some other guileless soul, likewise standardized, though in a different political mould. You needn't pity us oldtimers of the last war, nor the generation that will fight the next one. Soldiers, by and large, are cheerful souls. If they survive, they arrive at the conclusion that the war was a lot of fun-most of it.

By 1917 Voss had learned enough to leave the front and become chief pilot of an advanced observation school. As a side line he used to test new planes and flew about all the different types there were. He never returned to the front and, like myself after my tour of duty over the lines, spent the rest of the war preparing the younger and greener lads for the fray.

After the war, Ernst Voss flew on a Dutch airline for two years, but in 1923, hearing of the fortunes being made in America, he left the land of good beer and emigrated to America. His early activities are unknown to me. Whether he started flying then or joined a German band, I don't know. But during the Lindbergh upheaval he got his transport license, spent a short time with Vance Breese, became chief pilot of Deaton Air Service, and so by a gradual progression was operating his own school by September, 1929, and like Johnny Walker. is still going strong. The next war will find us on the same side-of the street. We'll be waving little flags and cheering lustily as the young lads march off to indulge in the same sort of foolishness we took so seriously fifteen years ago.



## **OUR READERS AIR THEIR VIEWS**

Dominic Bianco bewails the sad lot of the inventor in this country and diagnoses the infirmities of the Government's engineers as "mathematical brain feve."

It is about time the Government took proper precautions in instructing its different departments in receiving mail from inventors and designers and to answer such mail in a courteous, efficient manner, in order to safeguard the invention for the inventor and the Government.

All or most of the inventions from American citizens who have no money to perfect their inventions are practically refused recognition by the United States Government. Is it afraid to spend a little money for research? Or is the N.A.C.A. waiting to use some of its mathematical brains to get an idea of its own?

Other governments have backed poor men in their inventions and have made tremendous successes of them. I believe the big engineers in this country do not wish to have their footing uprooted. They want to stay unmolested to show the public that they are the only ones that have thinking power to accomplish the wonders of aviation. That's too bad. They are troubled with a mathematical brain fever. They know too much. They cannot think of anything but aerodynamics and mathematics.

An American man was the first to invent the airplane but he was backed by England. Why? Was it because he had no money or was it because the engineers of this government thought that they should be the only ones to put forth an idea? I am not talking about the United States Government as a whole body but about the men who think they can conduct a government's particular department by not thinking of the man who has no aerodynamics or mathematical wing sections installed in his brain.

Some of the men who conduct the national air defense think that in case of war they can build thousands of airplanes overnight. Little do they think that the airplanes of many other governments are at present far superior to our planes. Little do they think that is their overnight scheme our country can be demolished. The foreign powers are not throwing kisses at us across the pond.

The Government engineers are not giving this country adequate air protection. Mathematical wing sections are shooting across their brains. We all know what wing curves are. Why think of them all your life?

Leave your wings alone!

Charles A. Zweng, chairman of the Illinois Airport Legislative Committee, jogs a provocative elbow into the ribs of the aviation industry, "asleep at the switch":

I have been wondering why the aviation industry has been asleep at the

switch. AERO DIGEST for September shows 101 airplanes grounded in the state of Oklahoma by state air police. At this writing the air police of Illinois, under the act passed by our last legislature, are busy showing their authority by grounding airplanes not bearing a Federal license. A conservative estimate for Illinois would be 200 airplanes. Allowing a valution of \$1,000 per plane, the total would be three hundred thousand dollars worth of airplanes in dead storage. Airport owners claim unlicensed planes are doing the most flying and are most profitable to the airport, as the local owner flying for pleasure spends more money.

Mr. Hotchkiss in his work on aviation law points out the deplorable situation that can be caused by each state's passing aviation laws. I concede that it should be within the province of the Federal inspectors to ground airplanes, but it seems to me that some of these legislators who want to fly with one foot on the ground are jealous of those who get up with both ieet; at any event they have a mania for making new laws that are anything but constructive.

In any event, almost any airport in Illinois at this time is holding its share of grounded airplanes, and is like a graveyard. The general public in each community is given the false impression that the grounded ships have been declared unsafe by the Department of Commerce. Prospective purchasers of airplanes shake their heads wisely and conclude that buying an airplane is a poor investment.

The Department of Commerce should get these planes into the air and should do it quickly. As it stands now aviation is being severely damaged.

J. Don Alexander, president of the Alexander Aircraft Company, Colorado Springs, Colorado, outlines methods of making profits on local barnstorming:

Few pilots have realized the barnstorming and local sky-hopping profits to be made with a light plane. Even at this late date a majority of the population has never been off the ground. Advertise dollar airplane rides, and watch the crowds gather around Sunday afternoon. For a dollar, the operator merely swings a passenger around the field; it is sufficient for most passengers.

When dollar rides fall off in volume, try something special. Here is a plan which brought the Wyoming Air Lines \$600 on the first Sunday it was tried. Of course, this sum was netted with more than one plane. The plan can be carried out on a smaller scale with a single light

The operator induces a number of merchants to advertise a special Friday and Saturday sale. With each purchase of a dollar's worth of goods, the customer receives an airplane flight coupon. Taken to the airport on Sunday, the coupon, plus 98 cents, entitles the bearer to a fiveminute flight. Glad to get more merchants advertising, the local newspapers contribute ample publicity. The customer appeal of this plan is due to the old premium principle well-known to every successful merchant as well as every sideshow barker. "Something for nothing," or something for less than the usual price. seems irresistible to many people. Handed a discount coupon at the store, most people naturally desire to take advantage of the opportunity for an inexpensive airplane ride. The merchant sells more goods, the flier sells more rides and the newspaper sells more advertising. Everybody's happy, including the customer,

Selling aviation to the public in any form is specialty selling and as such requires constant mental alertness and the highest possible degree of sales effort.

Woodie Kane mentions a thing or two that Don Rose neglected to say about the English "hairplanes and hairlines":

Mr. Don Rose, let me congratulate you on your excellent article on aviation in England. May I present a few observations, some of which may be mildly at variance with your own? I have spent a little time in the Merry Isle at different periods before and since the war, and have found that as to weather they are slightly better off on the average than they were during Mr. Rose's visit.

A point that has always come forcibly home to me was that, in spite of holding the world's speed record, the English transport ships are slow, clumsy old biplanes that look sick beside those of Holland and France, let alone those of the United States. For a person accustomed to seeing the clean-lined Fords and Fokkers of our own country, the triple-or is it quadruple-bayed biplane transports of Old England are indeed an eyesore. Every time I see them they have added a longer cabin and another bay. If they get any bigger they can lay them with one wing tip on Dover and another on Calais, and use them for railroad bridges. But as airplanes they are obsolete, as the personnel of Croydon will readily admit as soon as they find they are talking to an American. "You 'ave us beat with your hair lines over there, badly beat" is the usual comment.

The "airports" of rural England are just what Mr. Rose says. They are pocket handkerchief fields. Hence the very early development of the Handley-Page wing slot over there. A necessity perhaps in England, but a darn nuisance over here.

NOVEMBER, 1931



## RHODE ISLAND STATE AIRPORT Island General Assembly. The proceeds of a bond issue, voted by referendum at

ONSIDERED a major addition to the airport facilities in the New England area is the Rhode Island State Airport, a 411-acre field at Hillsgrove, R. I., which was opened to the general public in July and formally dedicated in September. After an exhausive study of available land throughout Rhode Island, the site was selected for the State Airport as the best combination of suitability of terrain, convenience of location and the favorable nature of the prevailing weather conditions.

The field comprises a developed area of 158 acres, graded and turfed, with the entire surface cleared of all obstructions. Through the coöperation of the town of Warwick there has been established a height-limit zone bordering the airport, which prevents the erection of any structure more than twenty-five feet high within a distance of 1,000 feet of the limits of the field. Electric power and light, telegraph and telephone lines are installed below the ground.

The flying field is an all-direction field. The runways vary in length from 2,500 feet to 4,200 feet. It will be possible to extend all runways up to 4,500 feet and to 5,600 feet in the direction of the prevailing wind. Athough the field drainage is natural, an appropriation of \$8,000 is available for artificial drainage should future conditions require it. The entire area of the field is bounded by wire fencing with all fence posts set in concrete foundations. The fence is approximately 18,500 feet in length. Completed plans of the field include an administration building, a glider hangar and two airplane hangars. When the field was dedicated, two commercial companies were operating at the airport.

The Rhode Island State Airport is conveniently situated for ground communication and may be easily reached by railroad, bus, taxi or automobile. The airport is bordered by the Post Road, West Shore Road and the new four-lane Occupasstuxet Road, making it accessible from all points in Rhode Island. The Providence Post Office is approximately six miles distant over the highway and five miles by air.

The airport is supervised by the Rhode Island Airport Commission, created by an Act of the 1929 session of the Rhode Island General Assembly. The proceeds of a bond issue, voted by referendum at the 1928 general election were made available to the commission in the amount to \$300,000. To this sum, the 1931 session of the general assembly appropriated an additional fund of \$68,500.

The Commission, appointed by the Governor, by and with the consent of the Senate, and which took office in 1929, is as follows: Harry T. Bodwell, chairman; William D. Strachan, Percy W. Hathaway, W. Gordon Reed, Thomas J. H. Peirce, secretary.

All rules and regulations of the United States Department of Commerce and the General Laws of the State of Rhode Island pertaining to aircraft, aircraft operation, pilots and their qualifications, are in effect at the field.



Some of the principals at the R. I. State Airport dedication (left to right): Col. J. H. Peirce, Secretary of the State Airport Commission; Senator Harry T. Bodwell, Chairman of the Commission; Harold Gatty; Frederick S. Peck, State Finance Commissioner; Wiley Post; Frank A. Tichenor, publisher of "Aero Digest"; Chairman of the Republican State Central Committee, and 'Coll. Art Goebe.



#### **CURRENT AIRPORT AND AIRWAY FACTS**

American Airways Builds \$150,000 Hangar at Chicago Municipal Airport

THE Universal division of American Ariways, Inc., has awarded the contract for the construction of a hangar on the Chicago Municipal Airport to The Austin Company, airport engineers and builders of Cleveland. The hangar, of which the architect's sketch is shown above, is of steel construction with brick sidewalls, and will be 120 feet wide and 200 feet long. It will have a clearance of twenty-two feet under the trusses.

The project represents an investment of \$150,000 and will require 225 tons of structural steel. The hangar will replace one recently destroyed by fire on the Chicago airport.

#### September Is Peak Month of History for Many Transport Companies

R ECORD traffic was reported on a number of airlines during the month of September. Braniff Airways, Inc., carried an increase of sixteen per cent over the previous month, making September the highest month since the company started operation.

The Colonial Division of American Airways also had a record month, carrying 2,385 passengers. Century Air Lines reported a total of 7,512 passengers on its Middle West division, bringing the company's total to 40,213 passengers since March 23, 1931.

Revenue passengers carried by United Air Lines on its transcontinental, middle west, intermountain and western lines during the last two months were approximately thirty-three per cent more than during two previous months.

#### Illinois Stoker Co. Develops New Unit for Heating of Hangars

THE Illinois Stoker Company of Alton, Illinois, has just announced a new type of hangar heating unit which is a combination of a small chain grate stoker and a hot air forced draft heating unit. The company's 50-250 horsepower small chain grate stoker is used in this shop heating unit in connection with a newly developed hot air unit through which air is blown by a standard type

blower of 5,000 cubic feet per minute volume.

The simplicity and effective heating range of this unit make it desirable for heating of hangars and other large open structures. Since the entire heating installation is combined into one unit, a considerable saving in overall space requirements is made. Dimensions are 5 feet wide by 16 feet long by 8 feet high. With this shop heating unit no piping or other installation work is necessary other than providing a foundation for the unit, a stack connection and outlet connections to warm air ducts, if distribution requires a division of the outlet stream of hot air into two or more ducts.

#### New Air Commerce Bulletins Give Information on Air Transport

THE revised Air Commerce Regulations governing scheduled operation of interstate passenger air transport services are published by the Aeronautics Branch of the Department of Commerce in the September 15 issue of the Air Commerce Bulletin. This bulletin also contains statistics on air transport during the first six months of 1931, and other valuable information on airlines.

Other recent bulletins are: Regulations Governing Establishment and Certification of Aeronautical Lights, Aeronautics Bulletin No. 9, September 1; Airport Rating Regulations, Aeronautics Bulletin No. 16, September 1; Investigation of Aircraft Structural Failures for the Period July 1 to December 31, 1930, semi-monthly bulletin of October 1; and Second Report of Liaison Committee on Aeronautic Radio Research, semi-monthly bulletin, October 15.

#### August Traffic of Airlines Shows Decided Increase Over July

SCHEDULED air lines operating in the United States carried nearly 9,000 more passengers in August than in July, it has been announced by the Aeronautics Branch of the Department of Commerce.

Also, during August, the miles flown by scheduled air lines increased almost a half million and express increased about 60,000 pounds over July. These gains were shown by thirty-three of the forty-

two companies operating in July, and thirty-four of the forty-two companies operating in August in United States.

Passengers carried by the thirty-four reporting lines in August were 56,517, as compared with 47,756 carried by the thirty-three lines reporting for July. Reports from the same companies showed that express carried in August was 133, 296 pounds as against 72,208 pounds in July, and miles flown were 4,041,143 in August as against 3,559,147 in July.

#### Curtiss Condors Improve Service on Eastern Air Transport System

NEW Curtiss Condors airliners went into service on both the New York-Jacksonville and the New York-Atlanta routes of the Eastern Air Transport system on October 1.

Service to Atlanta had been previously announced, and the Jacksonville service resulted from a subsequent survey. As on the Atlanta run, Condors fly three times weekly and Curtiss Kingbirds alternate to give the present daily service.

In announcing the inauguration of the New York-Atlanta schedules with the Condors, AERO DIGEST incorrectly reported the ceiling of the ship flying on one engine to be 3,500 feet. Although 3,500 feet is the normal ceiling with a fixed pitch propeller, through the use of the recently perfected Curtiss controllable pitch propeller the ceiling on one engine can be raised to more than 5,000 feet. A typographical error in the same item placed the payload at 2,800 pounds whereas the Condor carries a payload of 3,800 pounds.

#### Average Trip of Air Travelers Increases During Last Eighteen Months

THE average distance flown by the 600,000 passengers who have traveled on American airlines since January, 1930, has been increasing, according to the Aeronautics Branch of the Department of Commerce. During the last eighteen months the average figure has been approximately 250 miles.

United Air Lines has announced that average distance flown on its coast-to-coast service is now 650 miles, a marked increase over a year ago and two and one-half times the average distance flown by passengers on all domestic lines.

# THE PZL 6 SINGLE-SEATER FIGHTER

Flown by Captain B. Orlinsky at the Cleveland Air Races

ONSIDERABLE interest was attracted at the 1931 Cleveland National Air Races by the P. Z. L. VI fighting plane flown by Captain B. Orlinski of Poland, a member of the international aerobatics team which participated in the daily exhibition events. This type of plane, one of the most recent to be adopted as a standard fighter by the Polish Air Service, is of unusual design with a number of features differing from the general construction of the more conventional monoplanes. A development of the Panstwowe Zaklady Lotnicze of Warsaw, Poland, the P. Z. L. VI is a strut-braced, single-seater monoplane fighter powered with a single Bristol Jupiter engine.

One of the more unique characteristics of this ship is the manner in which the wings are attached to the fuselage. The wing level is above the top of the fuselage, the wing roots being swept down to the fuselage into which they are faired. A major purpose of this arrangement is increased visibility for the pilot, which is further facilitated by a cut out in the trailing edge of the wing. Another purpose in sweeping the wing roots down, thus increasing the angle at which the wing meets the fuselage, is to reduce parasitic resistance.



Photo by U. S. Army Air Corps.

The all metal PZL 6 fighting plane powered with a Bristol Jupiter engine

covered with corrugated duralumin. The fuselage, however, is covered with smooth duralumin over a metal framework with an elliptical section.

An interesting feature of this Polish fighter is the construction of the landing gear. Each wheel is mounted on a stub axle which is attached to the apex of a steel tube Vee. The legs of the Vee are hinged to the bottom of the fuselage. Each Vee is braced inwards by a wire extending from the apex to a shock absorber housed inside the fuselage. When a landing is made, there is a tendency for the wheels to spread outward and upward. However, this spreading is resisted by the wire bracing which exerts a pull on the shock absorber, compresses it and provides the springing.

#### Specifications

| Wing span                    |
|------------------------------|
| Length overall               |
| Height overall               |
| Wing area186 square feet     |
| Landing gear tread           |
| Weight empty                 |
| Useful load                  |
| Weight of fuel               |
| High speed181 miles per hour |
| Climb to 26,200 feet         |
| Cailing 29 500 feet          |

## DISTRIBUTION OF LOADS ON WINGS

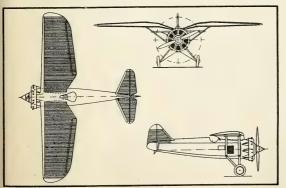
THE investigation discussed in N. A. C. A. Report 364, by Richard V. Rhode, was conducted at Langley Field, Va., at the request of the Army Air Corps. It was made for the purpose of determining the magnitude and distribution of aerodynamic loads over the wings and tail surfaces of a pursuit-type airplane in maneuvers likely to impose critical loads on the various sub-assemblies of the airplane structure. The phenomenon of center of pressure movement and normal force coefficient variation in accelerated flight was studied; and the normal accelerations at the center of gravity, wing tip, and tail surfaces were measured to determine the nature of the inertia forces acting simultaneously with the critical aerodynamic loads.

The results obtained throw light on a number of important questions involving structural design. Some of the more interesting results are discussed in detail.

#### LINING STEEL TUBING

A NEW method of lining steel tubing with a variety of metals or alloys has been announced by the Detroit Seamless Steel Tube Company which has secured patent rights to the process. In the application of this process to industrial uses, the inner lining metal is combined with the outer steel shell and bonded by fusion so inseparably that there is no evidence of separation and no manual means of destroying the union, according to officials of the company. Turnings made from the end of a tube so lined will curl off the tool so integrally united that the spiral which is formed shows both textures of the bonded metals as one continuous strip without fracture at any point between the two.

According to C. H. Hobbs, president of the Detroit Seamless company, the industrial possibilities of the process include the quantity production of steel-backed bearings. Any specified thickness of the bearing metal can be accurately controlled.



Scale drawings of the PZL 6 Polish military airplane

## **GERMAN** TRANSPORT **AIRPLANES**

(Part V) Edwin P. A. Heinze

UST as Professor Dr. Hugo Jun-kers is associated with ful development of landplanes, so is Dr. Claudius Dornier noted as a designer and builder of flying boats. The success of both pioneers in their special spheres of activity is equally as important in the history of aeronautics. Before the war. Dr. Dornier, at that time plain Herr Dornier (he received his doctor degree later in recognition of his work), was statical engineer in a factory producing balloon hangars. Here it was that Count von Zeppelin discovered him when ordering a new hangar for his dirigible. Dornier had conceived the idea of mounting dirigible hangars on wheels and rails to turn their openings in the direction of the wind. This was a very important invention because numerous dirigibles had been damaged or even destroyed by being thrown against the gate posts of the hangars by a side wind. About 1912 the Count took Dornier into his services as statical engineer. Soon, however, Count von Zeppelin equipped an experimental workshop for Dornier, the famous department "Do," which letters now precede the type designations of all Dornier aircraft. At the beginning of the war Count Zeppelin recognized that the country needed airplanes even more than airships, especially because the former can be built more quickly than dirigibles. Dornier's great chance came. An airplane factory was opened at Lindau, Lake Constance, and soon the first machines were supplied to the German Government. After the war, when the building of large airplanes was prohibited in Germany, a company was founded with German capital in Italy, and there the famous "Wal," one of the most successful flying boats of all times, was developed. In order to receive Italian orders, a part of the shares of the company was relinquished to Italians. Recently the F. I. A. T. combine acquired the majority. The Italian company exclusively builds the Wal. In the meantime the embargo on the construction of large airplanes in Germany was lifted, and the production of the larger version of the Wal, the Superwal, was begun in Germany. Some of these larger flying boats were also supplied to Italy, while, on the other hand, Germany imported from Italy some Wals, of which more than 200 are now doing service in all parts of the world.

In 1926 a company was founded in Japan, followed a year later by another in Holland, and in 1929 the General Motors Corporation and Dr. Dornier established the American company.

The German parent company has a capital of only 50,000 marks (\$11,900),

two-thirds of which is owned by the Zeppelin Airship Company. The remaining third is shared equally by a syndicate comprising the Zeppelin company, the Hamburg-American Steamship Company and the Luft Hansa.

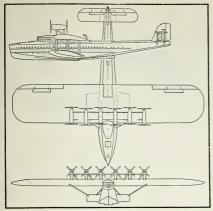
#### Special Features of Dornier Aircraft

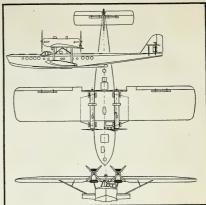
The Dornier Company, for the most part, builds flying boats for passenger and freight transport, in addition to two models of landplanes for the same purpose. Characteristic features of all Dornier flying boats are the practically rectangular main wings of uniform section and chord above the hull with the engine nacelles lying on top and the wing stubs on the sides of the hull, which in the water increase buoyancy and enable special wing supporting floats to be dispensed with. The tandem arrangement of two engines in a common nacelle, one operating a tractor and the other a pusher screw, is characteristic of Dornier flying boats. In the construction of these ships, which are built entirely of duralumin reinforced or replaced in specially stressed parts by steel pressings and castings, soldered and welded joints are entirely avoided. Rivets of special duralumin or steel are employed and at the joints caulking material of a very tough nature, retaining its qualities for many years of constant service, is generally used. Parts, which have to be removed occasionally for inspection are secured by bolts or screws. An important point, which Dornier has made into an axiom, is to secure easy accessibility of all rivets. Sheet metal is employed as skin. At the joints the abutting edges are turned up, caulking material is applied and a U-shaped piece of metal is pushed over, through which the rivets are then driven, securing the two Uflanges of the superimposed strip and the upturned sheet edges. The skin of the hulls is held by a number of transverse frames and bulkheads, the panels between these being stiffened by riveting on the inside a framework of formers dividing the large panels between the beam frames into numerous small rectangular sections reinforced occasionally outside by horizontal formers. In the older designs, the old Wal, Superwal and Delphin (to be described later), the hull has a rather blunt bow which in a choppy sea is not as advantageous as a sharp bow. The latter form has, for this reason, been adopted in the later designs. All Dornier flying boats have a single step about midships, into which the keel gradually merges. Transversely, the step is divided into two side and one middle sections which is of deeper draught than the side sections. Behind the step the middle section continues as a flat V-keel terminating in a rounded stern with an oblique sternpost, to which a small water rudder is attached, while the side sections likewise continue at a shallow V-angle and rise gradually out of the water towards the tail. The tops of the hulls are generally straight throughout. The deep center keel section behind the step has no effect on starting qualities as the boats rise out of the water practically on a horizontal keel. However, when coming down this section assures very soft watering as it gradually immerses and uniformly increases the displacement.

The wing stubs are built integral with the hull structure and, as is the latter, are divided into a number of water-tight compartments.

The main wing in all models is built in three sections, the central one generally having about one-third the span of the entire wing. This roughly is also the dimension of the stub wings. The middle section of the main wing is generally supported by a number of faired steel struts some distance above the hull deck. In the latest large models this space is used as a conning bridge. In all models the wings have no lateral dihedral angle. The engines are accessible in flight in all models by means of a ladder leading up into the nacelles from a manhole in the hull deck and in the wing. In the Do.X and the Do.S the nacelles are individually supported on struts above the wing.

In all but the latest models the wings of the Dornier flying boats have girder type spars of steel two or three in number with auxiliary spars of light metal in between. The spars each have two longerons one above the other, consisting of two drawn U-sections, one with a larger diameter than the other. The smaller longeron is pressed into the larger with the flanges up, thus forming a tubular body, over which the flanges of the outside section, to which the web profiles are secured, hang down. The web pieces are of open section and are so arranged as to form a triangular truss work. The ribs are of duralumin, a box type being used at many points. They are generally constructed open at the bottom to permit them being slipped over the spars after which the lower flange strip is drawn over and riveted into place. Diagonal bracing of struts or wire or both is provided. In some models the nose parts of the wing and the trailing edges are separately attached and are demountable units. In the older planes the wing is partially or entirely covered with duralumin, while in the later models sewn-on fabric is preferred; however, duralumin sheet is retained under and around the engine nacelles. On these parts formers lying in the wind direction are riveted on to admit of the wing being trodden on by mechanics. The attached side sections of the main wing are secured to the center section in the usual manner and are additionally supported by faired steel struts some-





Do. X with Curtiss Conqueror engines

Dornier Superwal with four engines

times together with auxiliary wire bracing leading from the center of their lower surfaces to the end of the wing stubs. In the wings the easy accessibility of all rivets is retained; combined with the simplicity of the design, this feature makes it possible to repair the wings with ordinary tool equipment practically at any point. In the mishap of the Do.X at Lisbon, where one wing was partially destroyed by fire, it was possible to make thorough repairs on the spot.

In regard to the engine arrangement there is one advantage of particular interest to be emphasized. Because the engines are installed above the center of gravity, operators can install practically any type of engine they prefer, as long as it has a suitable output, and change over any time from one make of engine to another. It is necessary only to alter or replace the nacelles to accommodate the new engines. The plane itself requires no alteration.

#### Do.X

The Dornier giant flying boat, the Do.X has not only been described at length in Arro Digest, but has been in the limelight of public interest so much that its features are generally well enough known so that we need not give more than a concise description for the sake of completeness.

From the Superwal with its twenty passengers and crew of four to the Do.X with its 160 passengers and ten-man crew, was a very daring step for the Donnier company. But, as may be supposed, a great amount of experimental and research work was accomplished before the commencement of construction.

The design, which dates back to 1924, was variously modified and then a wooden full-scale model of the Do.X was built to obtain a better conception of the dimen-

sions and the possible weights and stresses. This wooden model was followed by a metal model. Full scale spars were built and tested on specially devised apparatus. For the first time Dornier engineers discarded steel as a building material for spars and adopted duralumin. The Do.X was built in 570 working days and from the first rolling manoeuvres on Lake Constance, during which it accidentally took to the air and flew, it was quite a surprising success. Few alterations of secondary importance were necessary to bring the ship to its present degree of development.

The Do.X has a length of 131.4 feet, a height of 33.6 feet and a span of 157.5 feet with a supporting area of 5,232 square feet. The constructional details are similar to those of the other Dornier flying boats. The wing is not, however, supported some distance above the hull but rests on top of it, or rather, the middle section of the wing is built integral with the top of the hull. For this reason the engine nacelles, each with two engines, were mounted on struts above the wing to make room for the propellers. Six nacelles with twelve Curtiss Conqueror engines of 625-horsepower maximum output each have been distributed over a distance of approximately 65 feet along the wing so that their weight is decentralized, enabling the spars to be built relatively lighter than if the whole engine power had been concentrated in or over the hull-supposing that to have been possible.

At first the Do.X had air-cooled radial Jupiter engines built under license by the Siemens & Halske Company of Berlin. At that time the nacelles were connected by a narrow airfoil extending right and left beyond them to obtain additional lift. But this apparently did not prove practical, for when the Jupiter en-

gines were replaced by the present engines, this airfoil was discarded, its place being taken by simple faired struts horizontally joining the nacelles. The Jupiter engines were removed because they did not supply the power required in constant service.

The Do.X is owned by the German Ministry of Transport, and its ultimate use apparently has not yet been decided. It was not designed for trans-Atlantic traffic but rather for long-distance coastal service. Dr. Dornier had in mind service along the American Atlantic Coast with its many big capitals, industrial and commercial centers, which promised a sufficiently large paying load at all times.

The hull of the Do.X has three decks. The keel deck is used solely for fuel and oil storage. Above it is the main or passenger deck with cabins, dining rooms, lounges, a bar, kitchen, etc. Above this and partially integral with the wing structure is the operation deck with pilots' cabin, chart room, rooms for the engineers and the wireless operators. The engines are accessible during flight through trap doors leading from a passageway in the wing out onto the wing top beneath each nacelle, into which the mechanic can climb up a ladder. The wing is not what is known as a highlift type, but owing to its great dimensions there is enough headroom in the thickest part of the wing for a man to walk almost upright without difficulty from one end to another.

The Do.X weighs fully equipped, but without crew and fuel, 29.5 tons and is capable of taking a normal load of 15.7 tons or a maximum of 23.6 tons, so that its gross flying weight comes to 45.2 tons and 53.1 tons, respectively, resulting in a wing loading of 19.4 pounds per square foot, and 22.7 pounds per square foot, while the power loading is 14 and 16.5

pounds per horsepower. The ship with its Curtiss engines is faster than any other Dornier, being capable of a maximum speed of 143 miles per hour. The normal cruising speed, however, is 100 miles per hour, making plenty of reserve power available. The ship is able to fly and maintain an altitude with only eight of the twelve engines functioning.

The control surfaces are balanced by compensating airfoils as in the other Dornier craft. The empennage is similar in general design, differing only by having a second and much smaller stabilizer fitted below the normal one. Between these, two perpendicular fins are arranged, which can be set to any desired angle during flight to balance steering in the event of several motors on one side of the ship fouling. The take-off of the ship is excellent. On a perfectly calm day it left the water in 55 seconds, weighing 45 tons, while in windy weather it has been known to rise clear in 21 seconds.

The Do.X II, built to the order of Italy, has been completed. It is fitted with twelve F.I.A.T.-A 22 engines of 600 horsepower output each.

#### The Dornier Wal

It has been stated above that the Dornier Wal is one of the most successial flying boats of the present time. Aside from many other notable flights, four crossings of the Atlantic have been achieved in a Wal: the first in 1926 by the Spaniard, Major Franco, from Spain to Buenos Aires; the second in 1927 by Major de Beires from Portugal to Brazil; the third in 1930 by the German, von Gronau, via the North route from Germany to Chicago; and the last by von Groneau again over the same route.

The Wal as a passenger ship has spacious accommodations for ten persons, in addition to a crew of two. The span of the main wing is 73.8 feet and the area is 1,044 square feet. The chord is 14.1 feet. The center section carrying the single nacelle with two engines is supported on four vertical struts reinforced by four diagonals. The attached wing sections measure 32.8 feet. The wing has two steel spars and is covered with fabric. Two steel struts on each side help to support the end sections. In some older machines additional struts lead up from the attachment points of the wing struts on the stub wings to the tops of the vertical struts holding the center wing sec-

The hull has a blunt bow with a shallow V-keeling merging into the type of step described as characteristic of all Dornier flying boats. The interior is divided by water-tight bulkheads with manholes and doors. The bow compartment has a collision bulkhead and contains sea equipment. Next is the comfortable cabin for ten passengers, behind which is a small space with the lavatory on the port side and the pilot's compart-



The latest Do.X built for Italy and powered with Fiat engines

ment on the starboard side. To the rear is the tank room. In ships of this class exclusively used for freight and mail transport the arrangement is frequently different with the pilot's compartment farther towards the bow.

The empennage is a cross-shaped unit bolted on top of the hull at the tail and laterally supported by struts connecting the hull and the stabilizer. The latter and the large rudder fin have steel spars and duralumin ribs. The rudder fin is cov-ered with fabric. The stabilizer has duralumin skin. The rudder has a seamless duralumin tube as pivot and ribs of the same material covered with fabric. All control surfaces, including the ailerons, are balanced by small compensating planes permitting the plane to be steered with a minimum of exertion. As in all Dornier aircraft, dual control is provided. the steering transmission consisting of steel cables conducted inside the hull over pulleys running on ball bearings.

Practically any engine of suitable power can be installed, such as Rolls Royce Eagle, Lorraine-Dietrich, Napier Lion, BMW VI, Asso, Jupiter and Renault. With two B.M.W. VI engines preferably mounted, delivering 500 to 600 horse-power, the Wal will attain a maximum speed of 130 miles per hour. The cruising and watering speeds are, respectively, 106 and 61 miles per hour. Normally five fuel tanks each holding 74 gallons are provided, making a total available quantity of 370 gallons, on which the ship will fly a distance of approximately 650 miles. The fuel capacity may, however,

be increased to 1,060 gallons, giving a cruising radius of approximately 1,860 miles.

The radiators for water-cooled engines may be installed at any suitable point on top of, on the face wall or below the nacelle, on the wing or on the hull. Generally they are arranged behind the propeller hub in the face wall of the nacelle or above and below the latter.

The Wal has a length of 57.25 feet and weighs, including its complete equipment but otherwise empty, 9.020 pounds. The normal loading capacity is 4,180 pounds which may be increased to 7,700 pounds, with normal load the ship weighs 13,200 pounds, and with maximum load, 16,720 pounds, spaking a wing loading of 12,30 pounds per square foot in one case and 16 pounds per square foot in the other. The power loading, respectively, comes to 11.1 pounds per horsepower and 13.6 pounds per horsepower and 13.6 pounds per horsepower and 13.6 pounds per horsepower.

#### The Superwal

While the Wal was being built abroad, the German Dornier Company concentrated on the design and production of a bigger type of ship as soon as this was permissible. The result was the Superwal.

The Superwal in its constructional features is very similar to the Wal. It is produced both with one engine.nacelle in the center having two engines as in the case of the Wal and with two nacelles having four engines.

(To be continued in the next issue)



The twenty-passenger four-engined Dornier Superwal

"Mud conditions very bad...

WE EQUIPPED ALL OUR TRANSPORT PLANES WITH AIRWHEELS"

says NORTHWEST AIRWAYS

THERE was a time when one soft landing field in a chain of passenger transport stops could tie up air transportation.

But field conditions don't make much difference when your ship is equipped with Airwheels, as this letter from Northwest Airways demonstrates:

"Last February we opened our line from St. Paul to Pembina, North Dakota. Having operated in that territory before we were aware of the fact that mud conditions in





the spring were very bad. To counteract this we equipped the Hamiltons on this line with Goodyear Airwheels. The service that the Airwheels gave us on this line was so satisfactory that we have since equipped all of our Hamiltons with them.

We firmly believe that the use of these Airwheels has decreased the maintenance cost on our Hamilton planes and has also very much increased the comfort of the passengers riding on these ships."

With the winter ahead—it will pay you to find out now what Airwheels can do to give your ships greater safety in landings on snow and muddy fields—how these great soft cushions can eliminate many of the minor hazards of take-off and landing under tricky weather conditions.

Only Goodyears can give you Airwheel safety.

EVERYTHING IN RUBBER FOR THE AIRPLANE



### THE SUPERMARINE S6B

ESS than seven months of intensive work produced the Vickers-Supermarine S6B monoplane and the Rolls-Royce racing aircraft engine which won for Great Britain permanent possession of the Jacques Schneider international seaplane trophy and set the world's new speed record of 408.8 miles an hour. British participation in this year's Schneider contest was not definitely decided till the end of January. The period remaining before the contest was considered insufficient for the design, construction and test of new planes and engines; it was necessary to develop the designs that were successful in 1929.

Externally the 1931 S6B racing monoplanes are similar to the 1929 Supermarine S6 craft, the chief difference immediately perceptible being the much longer floats used in the newer machines. These aircraft are low-wing braced monoplanes built of steel and duralumin, equipped with twin floats.

A higher wing-loading and a reduction in spower loading resulted in the increase of speed obtained this year over 1929, from 328.63 miles per hour to 340.08 miles per hour over the Schneider course, and from 357.7 miles per hour to 408.8 miles per hour over the three-kilometer speed course. That the landing and take-off speeds were not appreciably greater than in 1929 indicates the superior aerodynamic qualities of the new planes.

Britain's new racers were built primarily for participation in the Schneider contest. The distinction is important, because a machine designed and built exclusively for the speed record would probably differ in many details from a Schneider racer and would be unable to carry sufficient fuel for the Schneider course, considered the more difficult.

The 2,300-horsepower Rolls-Royce racing engine—twenty-one per cent more powerful than the 1929 powerplant but only 6½ per cent heavier—required radiator surfaces able to dissipate 40,000 British Thermal Units every minute. Water-cooling radiators therefore occupied every possible inch of the upper and lower surfaces of the wings and the upper surfaces

of each float. Oil was carried in a reservoir in the tail fin and cooled in passing through radiators located on both sides of the fuselage. The efficiency of the oilcooling system was increased by forty per cent, small vanes sweated into the oilways proving effective once experiment had indicated the best type and pitch of vane to be employed. The watercooling surfaces proved to be adequate to deal with the greatly increased power and cooling problems. Use of a double radiator skin on the topside of the floats instead of shell plating required an elastic framework for the radiators in order that the expansion caused by the inflow of nearly boiling water from the engine (approximately one-half inch) should not cause buckling of the skin. A special steam separator tank, allowing steam only to escape into the atmosphere, was another improvement adopted this year.

Fuel is carried in tanks within the floats, from where it is forced by enginedriven suction pumps to a small pressure tank in the fuselage. Considerably more fuel is put in the starboard than the port float to counteract the propeller torque, equivalent at full throttle to a transfer of a load of 500 pounds from starboard to port. On steeply banked turns the centrifugal force is five or six times gravity; the suction pumps consequently cease to operate and the engine is fed during the turn on the fuel supply in the pressure tank. Because of a tendency for fuel to transfer from one float to the other, a special venting system in the overflow pipes from the header tank was installed.

Flutter of the control surfaces was eliminated by the use of streamlined mass balances on the ailerons, rudder and elevators. When the planes were traveling at speeds of from 350 to 400 miles per hour the minute inaccuracies of construction produced air loads on the fin and tail plane, which called for correcting loads upon the control lever and rudder bar. No change in rigging was possible because the tail unit is built into the fuselage. The elevators and rudder were therefore provided with small flaps on their trailing edges which were adjusted

to the angle necessary to trim ship at top speed with hands and feet off.

The kind of propeller employed seriously affected control on the water. A new propeller measuring 102 inches in diameter, compared with the 114-inch diameter used in 1929, caused violent swinging to port even with full starboard rudder in the early stages of the take-off run. Actually the 1929 propeller provided easy take-off, giving better results on the new machines than on the 1929 craft because of the improved float design. Eventually propellers 109½ inches in diameter were adopted. These gave satisfactory take-off and good performance in the air.

The Rolls-Royce racing engine used in the Schneider contest and in Flight Lieutenant Stainforth's first attack on the world's speed record produces 2,300 horsepower, an increase of 400 horsepower over the power produced by the 1929 engine from which it was developed. A specially tuned power unit, burning a new kind of blended fuel, was fitted to the racing plane for the second attack on the record, when Stainforth averaged 408.8 miles per hour. This motor developed 2,600 horsepower. The new fuel contained refined gasoline, a high percentage of wood alcohol and a proportion of ethyl.

The 1931 standard racing engine built for the Schneider racers develops twenty-one per cent more power than the 1929 engine, but its weight is only 6½ per cent greater, being 1,630 pounds as compared with 1,530 pounds. At the standard rating of 2,300 horsepower, the weight per horsepower is .71 pound.

In cylindrical capacity and main external dimensions the racing engine is exactly the same as the Rolls-Royce "Buzzard" 825-horsepower service engine, being a super-charged water-cooled twelve cylinder "V" engine, with six-inch bore and 6.6-inch stroke. Power was increased over the 1929 racing engine by raising the engine speed and the super-charger gear ratio and increasing the size of the air intake. In an hour's non-stop run at full throttle on the test bench the engine gave a steady 2,350 horsepower at 3,200 revolutions per minute.

Externally the chief difference between the racing and the standard Buzzard engines is the shape and dimensions of the superchargers. The bulk of air drawn into the racing engine—at the rate of 250,000 cubic feet an hour—enforced an increase in size. A cumbersome supercharger unit was avoided by taking air into the rotor on both sides. The intake is located in the "V" of the engine, where it is sheltered from sea spray. Air traveled to the rotor along a sheet-metal air channel which was shaped in a manner to compress the air slightly and then to slow it down before entering the carburetor.

The propeller reduction gear, of the straight spur type, is modified from the

standard unit to conform with the shape of the fuselage nose planned by the aircraft designer. Similarly the camshaft and rocker covers were modified to provide a good outline for faired casings and beneath the engine the auxiliaries were raised a little to reduce the depth of fuselage needed to accommodate the engine.

An entirely new type of connecting rod was developed and alterations made to the crankshaft and crankcase, fitting these components to withstand the terrific loads imposed.

Oil consumption totaled a considerable amount at the 1931 speeds and powers, partly because large quantities were lost through the breathers. On one twentyfive minute run oil was "used" at the rate of no less than 112 gallons per hour. Work on various combinations of scraper rings and crankcase breathers, modification of the scavenging system and the final adoption of a deeper sump which filled all the available space in the plane reduced oil consumption to approximately fourteen gallons per hour. The deeper sump had the additional advantage of causing a considerable reduction in the oil temperature rise through the engine, the pure castor oil employed entering the engine at 80 degrees C. and leaving it at 140 degrees C.

Hiduminium alloys (R. R. 50 series) were used for all aluminum parts. Forged aluminum replaced bronze and steel in many parts of the engine.

#### Specifications

|    |                 | 1931 ѕбв                  | 1929 s6          |
|----|-----------------|---------------------------|------------------|
| S  | oan             | 30 ft                     | 30 ft            |
| C  | hord            | 5 ft. 8 in                | 5 ft. 8 in.      |
| V  | Ving area       | 145 sq. ft                | 145 sq. ft.      |
| V  | eight empty     | 4,560 lbs                 | 4,030 lbs.       |
| Ē  | ilot            | 160 lbs                   | 160 lbs.         |
| ř  | uel (135 gals.) | 1,125 lbs960 l            | DS. (115 gais.)  |
| Ų  | ul (15 gal.)    | 5,995 lbs                 | IDS. (10 gal.)   |
| 11 | Weight, loaded. | 41.3 lbs./sq. ft36.3      | ? The / sq ft    |
| p  | ower loading    | 2.6 lbs./h.p              | . 2.76 lbs./h.p. |
| -  | Ower loading    | TITTELO IDOI, III PITTETT |                  |



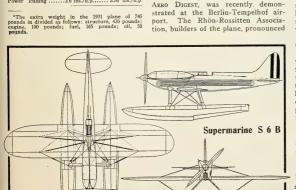
#### VIKING "KITTY HAWK"

A DESCRIPTION of the Viking Kitty Hawk, manufactured by the Viking Flying Boat Company, New Haven, Connecticut, was presented in October issue of Aero Digest on the page devoted to the description of approved type airplanes now in production. A typographical error caused the capacity of the baggage compartment to appear as 4 pounds. The correct figure is 43 pounds.

Although the outline drawing of the Viking appearing in connection with the description does not show the dihedral, there is actually a dihedral on the upper wing of 1.5 degrees and on the lower wing of 4 degrees.

# **TAILLESS AIRPLANE**

HE new German tailless plane, a view of which is shown on the frontispiece of this issue of AERO DIGEST, was recently demon-



the tests very satisfactory.

The Hermann Kohl, as the plane has been christened in honor of the wellknown ocean flier, was first built as a sail-plane and altered into a motordriven craft when the flights seemed to indicate satisfactory operation. In the recent tests the plane showed a high degree of maneuverability, the pilot maintaining that it steers very lightly and that he can do anything with it that he can do with any normal plane. Press representatives said that the plane seemed to have plenty of reserve power and seemed practically non-stallable.

The distinguishing characteristic of the new plane is its abandonment of the conventional tail, the fuselage and control surfaces being constructed into the wing. The elevators are constructed as a second set of ailerons, located on the trailing edge of the wing. The whole trailing edge of the wing is made up of ailerons, the outer set being used for lateral control as in the normal airplane, the inner for longitudinal control.

The rudder fins are located on the wing tips and, operating differently from conventional rudders, work independently of each other. The left pedal is connected solely with the left rudder and the right pedal only with the right. In making a turn the pilot uses only the rudder on the side in which he wishes to turn, the other remaining neutral. The unobstructed wing tip swings around to make the desired turn. The rudders have a flat surface facing outward; the inner surface has a pronounced camber.

The wing is of the cantilever type with a pronounced lateral dihedral angle. Its plane contour is an equilateral triangle, with the long base line constituting the trailing edge. Construction is of wood with plywood leading edge and fabric covering. No struts are used in the whole plane, which fact gives it a clean appearance.

The plane is powered with a Bristol Cherub engine of 28 horsepower.

The undercarriage consists of three wheels, one on each side of the fuselage and the third, smaller than the other two, located in the center of the cabin. All are enclosed in streamlined casing. On the small wheel this casing forms a continuation of a perpendicular fin on the front of the fuselage.

#### Specifications

12 65 Food

| Span                                     |
|------------------------------------------|
| Area of lifting surface269.1 square feet |
| Weight empty (fully equip-               |
| ped) 704 pounds                          |
| Useful load 440 pounds                   |
| Gross weight                             |
| Wing loading4.25 pounds per sq. ft.      |
| Power loading                            |
| High speed96.4 miles per hour            |
| Cruising speed87 miles per hour          |
| Ceiling (highest so far                  |
| reached )                                |
|                                          |

# RECENT TECHNICAL PAPERS

A BSTRACTS of papers of interest to the aeronautical industry, which follow, were presented at the Thirteenth Annual Convention of the American Society for Steel Treating, the meeting of the Machine-Shop Practice Division of the American Society of Mechanical Engineers, the Technical Session of the Society of Automotive Engineers, and the Fall Meeting of the American Welding Society. All these meetings were held in Boston, September 21 to 25, in connection with the National Metals Congress.

CAST IRON FOR CYLINDERS
Characteristics of Alloyed Cast Iron, F. W.
Spieley. Society of Automotive Engineers, Preprint, 20 pp., 23 figs.

T HE research described was undertaken for the purpose of determining some of the qualities which might be obtained in cast iron through the use of alloys. It was found that increased quality (which was reflected through higher valve-seat hardness) and improved microstructure could be obtained by additions of nickel and chromium to automotive-type cylinder iron. Different combinations of these alloys were used and it was found that a ratio of three parts of nickel to one of chromium gave the greatest improvement in structure in conjunction with maximum hardness. The effect of prolonged heating on three representative plain irons as well as on three nickel-chromium alloyed irons of the same base composition is shown and a marked difference is revealed in favor of the alloyed irons.

# INSPECTION OF WELDS Inspection of Welds with Gamma Rays, G. E. Doan. Am. Soc. for steel Treating, Preprint. 8 pp., 5 figs.

TESTS of welds made by the author at Lehigh University are described. The welds were fusion welds made in ½-in, and ¾-in, steel plate by five different commercial firms and submitted for testing. Of the ten welds tested, the gamma-ray method made it possible to pick out the five defective ones without error, and showed the five sound ones as such. The degree of definition and the sensitivity of the method seemed to be adequate to reveal welds of this kind. The author points out that it is important in examining welds that the distance from the source of radiation to the weld be as great as the strength of the source and the time available will permit

# INSPECTION OF STEEL Identification of Inclusions in Steels, L. E. Grant, Am. Soc. for Steel Treating, Preprint. 15 pp., 21 photomicrographs.

THE means employed by the author for identifying inclusions in commercial steels are discussed and it is shown that the inclusions are not always the comparatively simple substance one might conclude them to be from methods proposed for their identification and from microscopic examination of transverse specimens at low magnification. Examination at high magnification revealed them to be non-homogeneous in many cases.

#### ELSA GARDNER

The various etching reagents used in the systematic examination of inclusions for their identification were applied to inclusions containing two or more phases. The results are shown in a series of microphotographs, and it is suggested that additional and more selective reagents are required before complete identification of the phases of complex inclusions can be established with certainty by etching tests.

A BSTRACTS of papers of interest to the aeronautical industry, which follow, were presented at the Silver Anniversary Convention of the Illuminating Engineering Society, held at Pittsburgh, Pa., October 13-16.

#### AIRPORT LIGHTING

Report of the Sub-Committee on Airport Lighting, K. W. Mackall. Illuminating Engineering Society Preprint, 43 pp., 36 figs., 2 tables.

THE author takes up the night lighting equipment required for the different established ratings assigned by the Department of Commerce and explains the functions of the various pieces of equipment, including airport and auxiliary-code beacons, boundary-light systems, obstruction lights, illuminated wind-direction indicators, ceiling projector, ceiling height indicator, field floodlight system, roof markings, and building, loading-area, hangar-apron, and taxiway illumination. He describes in detail the various types and makes of lighting equipment showing, wherever possible, the light distribution produced by each. He recommends increasing the light intensity on the landing field, and makes suggestions for locating the floodlighting equipment about the landing area, as well as for the use of lighting other than that required for the rating.

#### LIGHT AND FOG

Transmission of Light through Fog. F. C. Breckenridge. Illuminating Engineering Society Preprint, 19 pp., 10 figs., 2 tables.

T is the purpose of this paper to correlate the experimental data regarding the transmission of light through fog and to determine upon what assumptions and to what extent the formulas agree with that data. The basis of two formulas developed by L. V. King, J. A. Stratton and H. G. Houghton, which have been applied to the spectral transmission of light through fog, is briefly described. Six researches carried out in the United States on the transmission through fog, haze, or mist, are reviewed and the application of the theoretical formulas to the results of these researches is discussed. Where feasible the constants of the formulas are derived, and the resulting curves are shown in comparison with those of the experimental data.

The author concludes that there can be no

advantage from the standpoint of transmission to be gained from filtering out any wave lengths present in the original source since each wave length is transmitted independently of all other wave lengths. There is no advantage from the standpoint of visibility to be gained from filtering out the blue end of the spectrum, and it was found that the visibility of a clear light was not increased by the use of a red filter. The experimental curves which have been considered and every one of the thirteen curves obtained by Karrer and Tyndall on nights that were not clear indicate lower transmission for blue light than for red. If the Stratton-Houghton formula is correct this indicates smaller particles than those attributed to fog by the meteorologist. From the standpoint of the illuminating engineer the problem appears to hold little of further interest, but from the standpoint of the meteorologist, it may still be one of considerable importance.

#### AIRWAY LIGHTING

Report of the Sub-Committee on Airways Lighting, D. C. Young. Illuminating Engineering Society Preprint, 19 pp., 16 figs.

A CHIEVEMENTS of the Department of Commerce in lighting the airways for night flying are pointed out by the Aviation Lighting specialist of the Edison-National Lamp Works of the General Electric Company. Full details are given regarding American practice in this field of lighting, including recommendations for the illumination of different types of obstructions. The latest developments in airway lighting equipment are illustrated and the arrangement along the lighted routes described. The practice of the Department of Commerce in providing intermediate landing fields is explained, and several new developments contemplated for the future are listed. The maintenance of airway equipment by the Lighthouse Service is also referred to

#### AIRPLANE LIGHTING

Report of Sub-Committee on Airplane Lighting, R. W. Cost, Illuminating Engineering Society, Preprint, 24 pp., 16 figs., 4 tables.

THE necessity for several classified applications of airplane lighting which are typical of American practice, is pointed out by the Aviation Lighting Specialist of the Westinghouse Lamp Company, and each application is described in detail, covering running, instrument-board, cabin, and landing lights and parachute flares. Characteristic methods of producing and regulating electrical power on board an airplane are taken up. Complete information is given regarding lamps for the various classes of service and types of lighting equipment are discussed and illustrated. Tables show the effect of voltage drop on light output of lamps, light transmission factors of typical running lights, and airspeed losses due to headlights suspended from the lower wing of an airplane. A typical wiring system is produced which indicates the recommended wire and lamp sizes.

NOVEMBER, 1931



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## SPERRY AUTOMATIC PILOT

#### Device Tested for Civilian Use

THE Sperry Gyroscope Company conducted a demonstration of the new Automatic Pilot at Newark Airport, October 7, for the benefit of a party of newspaper and magazine representatives. A Curtiss Condor was used for the test, which consisted of a series of flights around a predetermined course above the airport.

The Automatic Pilot is not used for take-off and landing, as these maneuvers require the attention and skill of a regular pilot, but once the plane has reached the proper altitude the course is set and the robot is left in charge. The principal dangers of blind flying are eliminated by the Automatic Pilot, as it is impossible for the gyroscopically controlled mechanism to permit the plane to fly upside down or to go into a spin. During flight it is possible to shift from automatic to manual control of the airplane and vice versa, at will. Through remote control the pilot may take over the guidance of the plane, changing course, climbing or diving, without disengaging the mechanical guide.

The Sperry Pilot is an electro-mechanical apparatus, gyroscopically controlled. An azimuth gyro maintains a fixed relation from which the airplane is directionally controlled. A vertical gyro provides the same datum from which the airplane is laterally and longitudinally controlled. The power required to operate the various control surfaces is provided by a constant speed wind driven propeller mounted outside of the ship's fuselage. The two gyroscopes are electrically driven from the plane's storage battery or generator, and running 15,000 revolutions per minute maintain sufficient directional force to be undisturbed by the accelerating and centrifugal forces continually encountered in flight.

The secret of automatic flying is in the method of mechanically duplicating human piloting. This is accomplished by a follow-up system through which rate and amount of control is automatically handled, and as the system is adjustable it can be adapted to any type of plane.

#### K-10 AERO CAMERA

THE new K-10 aero camera for oblique, vertical and close-up ground photographs has been announced by the Folmer Graflex Corporation, Rochester, N. Y., manufacturers. Streamlined to minimize wind resistance, this camera weights twenty-two pounds when loaded. It loads or unloads like an ordinary roll film camera and is designed for easy operation—two simple motions making a picture, a half turn of the crank and a slight pressure on release. The camera may be balanced by two scientifically

placed handles. Panchromatic type roll film is used. Capacity is twenty-five 5x7 exposures. A visible tally on the outside of the camera records the number of exposures made.

The focal plane shutter operates from one-fiftieth part of a second to 1-220 of a second maximum. A ten-inch Anastigmat f.4.5 lens with adjustable Iris diaphragm in the focusing mount permits focusing within eight inches of the lens. Direct vision box type finder and an efficient sprit level are provided.

#### Steelbestos Gasket

THE Steelbestos gasket, in which is incorporated a new departure in gasket design and manufacture, has been announced by the Detroit Gasket & Manufacturing Company. The gasket is composed of asbestos reinforced with steel. High heat and pressure resistance and the ability of adaptation to surface variation under compression are among the principal purposes for which the gasket was designed.

The gasket comprises a steel sheet stamped by a process which produces protruding tongues and cup-shaped depressions on both sides. Tongues and cups are closely spaced and staggered. Two sheets of high heat resistance asbestos, one on each side of the steel sheet which has been rendered impervious to gasoline, oil and water, are forced down over the tongues into the depressions under heavy pressure. During the compression operation the tongues are partially clinched over so as to anchor firmly the asbestos to the steel sheet.

The final shape is cut out after the component parts have been assembled into a permanent unit. According to the company, this method simplifies the making of dies for producing gaskets, thereby reducing the time between receipt of blueprints and delivery of finished product.

#### Bendix Carburetor

THE Bendix Stromberg Carburetor Company, Chicago, III, has announced a new small compact aircraft carburtor for two-, three- and four-cylinder engines, used on small airplanes and power gliders. This carburetor weighs 2½ pounds and is 4½ inches high. There are two models available, the NA-S2 for engines of fifty horsepower or less, and the NA-S3 for engines of fifty to ninety-five horsepower.

The mixture requirements of this type of engine permitting the application of a very small type of carburetor, no economizer, accelerating pump or mixture control is needed. A special throttle valve body, incorporating a back suction type of mixture control, is supplied at a slight additional cost for application where it is desirable.



View of the component parts of the Sperry Automatic Pilot showing the control panel (lower left) by means of which the ailerons, elevators and rudders are operated

#### The

# GENERAL AVIATION MANUFACTURING CORPORATION

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The operations which have been carried on at Hasbrouck Heights and Passaic, New Jersey, and at Glendale, West Virginia, will be transferred to Baltimore. The New York Sales office at 1775 Broadway will be maintained for the present.

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## COMMERCIAL INVENTION

Raymond C. Pierce, Vice President in charge of Engineering

General American Tank Car Corporation

HE world is prone to regard the inventor as a wild-eyed, longhaired individual working through the night in an old attic. There have been, no doubt, many such men. Perhaps some of them have developed worth while inventions, but most generally this type of inventor has toiled over problems of perpetual motion or inventions without commercial value.

The successful commercial inventor of today is a man of sound education, who knows what he wants to invent before he starts. Undoubtedly, commercial invention is an art. There is a refined technique which is likely to achieve results. Emphatically it should be differentiated from the haphazard method oftentimes employed in the development of new ideas.

Fundamentally, invention is straight thinking. It is necessary to know exactly what is to be accomplished, and then to use the available information and knowledge of prior art, employing a fundamental knowledge of basic principles and means and adopting existing art to the problem at hand.

Millions of dollars are lost in the invention and development of ideas which are commercially unsound. The true commercial inventor, upon discovering that it might be desirable to invent a new mechanism or a new means of accomplishing certain results, does not immediately think of ways and means of making his thought come true. Rather, he assumes that he has already succeeded in perfecting this invention and that it is entirely successful from an engineering standpoint. With this assumption he asks himself and his associates, "Now that we have it, what are we going to

It is astonishing the number of ideas that, even based on this practically impossible conception of mechanical perfection, fails to show a chance for commercial success. No great amount of time or money should be expended on an idea until a careful business survey is made and there is ample assurance that there is a reward for the money and effort which must be expended to develop the

Inventors and their business associates invariably underestimate the cost of development of an invention. An idea, no matter how skillfully handled, rarely succeeds in the first effort. If it is estimated that a machine built according to a new idea will cost a certain amount to construct, it is conservative to ask for an appropriation of ten times this amount before starting work. If the problem presents unusual difficulties, more than this

amount of money will be used before success is achieved.

On an average, with efficient management and skillful engineering a commercial machine is developed on the third

A good illustration of these principles is given by the invention and development of brakes for airplanes. A few years ago planes were not provided with brakes. This equipment was not needed because planes were of small sizes and had low landing speeds. The pilot was accustomed to taking chances. With only low engine power available, the weight of the airplane was of primary consideration. Even the simplest brakes added to the weight of the plane.

With the development of higher powered engines, average landing speeds were higher. Safety became a primary consideration and airplane brakes became a necessity. Brakes for small airplanes were not a particularly difficult problem, and in most cases were an adaptation of the automobile type of brake. The large airplane, however, presented a difficult problem. For example, to provide brakes for the large amphibion, capable of operation either on land or water, for a time seemed practically impossible,

The brakes on the large amphibion had to be of great power. When installed and in use they were alternately dipped in water and dried in the air. They were subjected to the corrosive action of salt water. The usual automobile brake which depends on the friction of one brake shoe to increase the pressure on the other shoes, became entirely unreliable under

# RECENT PATENTS

THE following patents of interest to readers of Aero Digest recently were issued from the United States Patent Office, Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, 1343 H Street, N. W., Washington, D. C., at the rate of 20c each. State number of patent and name of inventor when order-

Airplane package transfer apparatus. Lytle S. Adams, Seattle, Wash., assignor to Airways Patent Corporation. (1,818,835)

Equipment for airplane landing field or terminals. Abner F. Callison, New York, N. Y. (1,818,841.)

Undercarriage for aircraft, Geoffrey T. R. Hill, Yeovil, England, assignor to Petters Limited, same place. (1,818,891.)

(Continued on following bage)

the conditions in which an amphibion operates.

In this case of the amphibion there were evident commercial possibilities in developing the right kind of brake. If a good amphibion brake could be developed it undoubtedly would have a use. Such a brake would not need to be even as cheap as existing brakes because it would fill a need for which there was no substitute at the time.

Experience with existing types of brakes indicated that these could never be developed to meet the requirements of amphibion planes. Tests made with the larger Sikorsky amphibions showed that a brake without some form of amplification could not be made powerful enough to hold the enormous pull of the powerful engines. Power brakes were impractical because of their weight.

The automobile supplied the solution; not the brakes of the automobile, but the clutch. It is well known that a clutch made of multiple discs will exert a force proportional to the number of plates engaged, less one; that is, three plates are twice as effective as two, and five plates are four times as good. Here then was found the solution to the problem of the amphibion brake: make a multiple disc brake to secure the desired power without the use of servo principles which under the conditions of amphibion service, cause seizing and uncertain operation.

There was nothing new in the use of this type of brake. However, the multiple disc principle is inherently heavy. The invention then, had to comprise a new combination of mechanical elements to give a multiple disc brake which could be made light and strong.

Once worked out, the brake was simplicity itself. Fingers fastened to the wheel rim drove two rings running between three sets of arms attached to the axle and forming the stationary members. Three hydraulic cylinders served to clamp the stationary arms to the rotating rings. Fourteen pounds of brake on each wheel would stop a 10,000-pound airplane landing at seventy miles per hour, within 300 feet instead of the roll of 1,200 feet formerly required.

The development of this successful invention illustrates the value of a sane approach to a problem in order to fill a need which is known to exist. Numerous other examples of the application of straight line thinking to successful commercial invention could be cited.

Before spending money for the development of new ideas, first assume that such an invention has been developed. Consider whether or not it can be commercially successful. If the possible profits are restricted, endeavor to calculate the maximum expense which may be required for the development of the invention. Be conservative and figure that it will cost at least ten times the estimated cost of the first model.

Do not be pessimistic, but avoid the thought that "There's millions in it." Most likely there is not.

NOVEMBER, 1931



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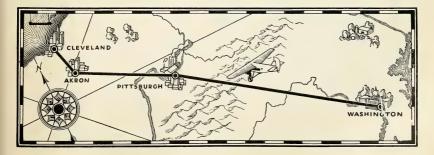
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#### RECENT PATENTS

(Continued from preceding page)

Bulkhead for rigid airships. Karl Arnstein and Paul Helma, Akron, Ohio, assignors to Goodyear-Zeppelin Corporation, same place. (1,818,952.)

Grapple for airplane package transfer apparatus. Lytle S. Adams, Seattle, Wash., assignor to Airways Patent Corporation. (1.818.956.)

Airplane wing construction. James V. Crichton, Philadelphia. (1,818,971.)

Helicopter. Milford L. Darr, Oakland, Calif. (1,819,075.)

Aeroplane. Per A. Peterson, New York, N. Y. (1,819,262.)

Aeroplane propeller. Raymond L. Rymal, Riverside, Ill. (1,819,340.)

Inductor compass generator. Morris M. Titterington, Brooklyn, N. Y., assignor to Pioneer Instrument Co., same place. (1,819,488.)

Combatting sleet on airplanes. Charles F. Chisholm, Staten Island, N. Y. (1,819,497.) Aeroplane. Max F. Schultze, Mandan, N. Dak, (1,819,794.)

Airplane vertical rudder control mechanism. Edwin M. Walden, Tampa, Fla. (1.819.801.)

Helicopter. Maitland B. Bleecker, Hempstead, N. Y. (1,819,863.)

Airplane. Federico G. Diago, Habana, Cuba. (1,819,948.)

Aerial navigation system and method. Geoffrey G. Kruesi, Palo Alto, Calif., assignor to Federal Telegraph Co., San Francisco, Calif. (1,829,004.)

Aeroplane hatch coaming. Roy J. Davis and George E. Watts, Portland, Oregon. (1,820,053.)

Runway for airplanes. James Gafney, New York, N. Y. (1,820,062.)

Adjustable stabilizer and fin. William K. Ebel, Cleveland, and Lessiter C. Milburn, Wickliffe, Ohio, assignors to Glenn L. Martin Co., Cleveland. (1,820,271.)

Aeroplane propeller. Joseph Liska, Lakewood, Ohio. (1,820,467.)

Aeroplane. William H. Gray, Parramatta, N. S. W., Australia. (1,820,613.)

Angle-indicator for aircraft. Robert J. Forest, Port Angeles, Wash. (1,820,791.) Screw propeller. Victor Lougheed, Washington, D. C. (1,820,814.)

Control device for aeroplanes. Charles R. Bowers, South Bend, Ind. (1,820,906.)

Aircraft. Henry P. Massey, Montclair, N. J. (1,820,919.) Aircraft. Harold F. Pitcairn, Bryn Athyn,

Aircraft, Harold P. Picairi, Byn Arnyn, Pa., assignor to Autogiro Company of America, Philadelphia, Pa. (1,820,946.) Airplane safety device. Jacob Zinkowet-

sky, New York, N. Y. (1,820,958.)

Means and method for loading aircraft. Alexander F. Godefroy, Los Angeles, Calif. (1,821,057.)

Semi-buoyant aircraft. George A. Jinkins, Philadelphia, Pa. (1,821,061.) Dirigible construction. Levi S. Holland,

Oakland, Calif. (1,821,158.) Stabilizer for airplanes. Frederick J. Pike, Buffalo, N. Y. (1,821,273.)

Aeroplane. Daniel C. Roberts, Trenton, N. J. (1,821,323.)

Hydraulic brake for aeroplanes. Edward B. Boughton, Willie Emmott, Denis T. Brock and Austin C. Burdon, London, England. (1,821,419.)

Mail-bag parachute. Charles M. Graeff, Harrisburg, Pa. (1,821,433.)

Propelling device for aircraft and the like. William Stelzer, Chicago, Ill., assignor to American Propeller Co., Baltimore, Md. (1,821,450.)

Aeroplane. Horace L. Campbell, St. Louis, Mo. (1,821,494.)

Aeroplane control switch. Celestino Rosatelli, Turin, Italy, assignor to Fiat Societa Anonima, same place. (1,821,581.) Air mail unloading and pick-up apparatus.

Frederick W. Weidman, Drumright, Okla. (1,821,599.)
Adjustable wing safety device for aircraft.

Edward J. Murray, Glenside, Pa. (1,821,-764.)

Anti-ice airplane and improved wing con-

struction therefor. Archie C. Vining, Brooklyn, N. Y. (1,821,776.) Course-indicator for aircraft. Arthur J.

McGrath, Washington, D. C. (1,821,844.)
Aerial machine (propulsion means including a magazine of explosive charges).
Joseph Schulman, Brooklyn, N. Y. (1,822,-063.)

Steering device for aeroplanes. Harold G. Davis, Denver, Colo. (1,822,082.)

Aeroplane-wing construction. Arthur E. C. Thomas, San Bruno, Calif. (1,822,179.) Aeroplane. Louis Bechersau, Paris, France. (1,822,196.)

Airship. Delores S. Colby, Waterways, Alberta, Canada. (1,822,202.)

Box-shaped central portion of metal aircraft-wing. Ludwig Staiger, Spandau, Germany. (1,822,247.)

Aeroplane-fuselage jig. Joel D. Bunch, Hollywood, Calif., assignor to Earl Aviation Corp., Los Angeles, Calif. (1,822,270.) Package pick-up device for aircraft. Maurice S. League, Tacoma, Wash. (1,822,354.)

Aircraft, Alex Anderson, Seattle, Wash. (1,822,386.)

Aircraft. Louis A. Cadoret, Pawtucket, R. I. (1,822,476.)

Aeronautic device, Angelo R. Novo, Guadalupe, Calif. (1,822,782.)

Airship. Julius B. Ellinger, Seattle, Wash. (1,822,849.)

Wing structure for airplanes. Hugo Sundstedt, New York, N. Y., assignor to American Navigation Corp., same place. (1,822,-940.)

Airfoil, John S. Maxwell, San Diego, Calif. (1,822,976.)

Means for mooring and housing airships. Wilfred V. N. Powelson and Warren Travell, New York, N. Y. (1,823,063.)

Airplane appliance. Robert C. Stropp, Rome, Ga. (1,823,069.) Aeroplane landing. George W. Charette,

Lemon Grove, Calif. (1,823,086.) Aeroplane-propeller. Frederick A. Guenther, La Grange, Ill. (1,823,197.)

Mooring-mast for airships. Wilfred V. N.

Powelson and Warren Travell, New York, N. Y. (1.823.287)

Stabilization of airships. Wilfred V. N. Powelson and Warren Travell, New York, N. Y. (1,823,288.)
Housing equipment for aircraft. Wilfred

V. N. Powelson and Warren Travell, New York, N. Y. (1,823,289.)
Aircraft. John D. Weber, Upper Lake,

Calif. (1,823,417.)

Rudder. Eugene Van Note, Jersey City, N. J. (1,823,433.) Aeroplane. Edmond A. Huseby, Chicago.

III. (1,823,655.)
Float for flying machines. Claude Dornier, Friedrichshafen-on-the-Bodensee, Germany. (1,823,730.)

Airplane. Jonathan P. Glasby, Verona, N. J. (1,823,735.)

Safety device for aeroplanes, Frank R. Owens, Beaver Crossing, Neb. (1,823,758.) Safety attachment for aircraft. Louis Friedrich, Yonkers, N. Y. (1,823,799.) Airship, John Braunwalder, Los Angeles,

Calif. (1,823,875.)
Aircraft. Giacomo Cartasso, Oakland,

Calif. (1,824,010.)
Helicopter. Rudolph Chillingworth,
Brooklyn, N. Y. (1,824,195.)
Airship. Don W. Wells, Los Angeles,

Calif. (1,824,250.)

Aircraft, Young Ho Koun, New York N. Y. (1,824,280.)

Propelling system for aircraft. Louis Breguet, Paris, France. (1,824,325.) Aeroplane station. William B. Harison,

Garden City, N. Y. (1,824,346.) Airship. Nathaniel G. Warth, Gallipolis,

Ohio. (1,824,453.)
Cargo-carrier for aircraft. Charles H.

Jacobs, San Francisco, and Asa F. Harshbarger, Oakland, Calif. (1,824,550.) Cargo-carrier support. Charles H. Jacobs.

San Francisco, and Asa F. Harshbarger, Oakland, Calif. (1,824,551.) Rotary propeller. Oskar F. A. E. Grum-

Rotary propeller. Oskar F. A. E. Grumpelt, Berlin, Germany. (1,824,667.) Means for mounting the propeller and its

Means for mounting the propeller and its prime mover on an aircraft. Clifford Fritz, Milwaukee, Wis. (1,824,882.)
Aircraft. Joseph J. Hicks, Los Angeles,

Calif. (1,825,115.)

Aeroplane-propeller Ignatz Glanschnis

Aeroplane-propeller, Ignatz Glanschnig, Gary, Ind. (1,825,184.)

Aeroplane. Rex B. Beisel, Hempstead, N. Y., assignor to Curtiss Aeroplane & Motor Co. (1,825,301.)

Aeroplane. Rudolph Chillingworth, New York, N. Y. (1,825,305.)

Airplane article-pickup shock-absorber. Lytle S. Adams, New York, N. Y. (1,825,-329.)

Wing and aileron construction for aircraft. Helmut J. Stieger, Wimbledon, London, England, assignor to Monospar Co., Ltd., London. (1,825,371.)

Propeller. George B. Jackson, Three Rivers, Mich. (1,825,401.)

Combination training device for student aviators and entertainment apparatus. Edwin A. Link, jr., Binghamton, N. Y. (1,-

825,462.)
Propeller. George Pemmsl, Dubuque,
Iowa. (1,825,473.)

# Passenger Hopping Autogiro Available

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# DIGEST OF FOREIGN TECHNICAL ARTICLES

REDUCTION OF LANDING SPEEDS The Bypaths of Aerial Navigation (Die Seitenwege de Lußtfahrt), T. Von Karman. Zeitschrift feur Flugtechnik und Motorluftschiffahrt, Vol. 22, No. 16, August 28, 1931, pp. 481-487 and (discussion) 487-488, 17 figs.

THE author takes up the question of whether the further development of the present types of airplanes is a step in the right direction or whether it would be better to start upon an entirely new line of development. He points out the chief deficiency of the present types of airplanes, namely the relatively high landing speeds, and surveys the possibilities for increasing the speed range of airplanes. He discusses in turn effects of influencing the flow of air upon the wing, and varying the size of lifting surfaces, and the advantages of the wing which has to perform an oscillatory motion, windmill airplanes, and helicopters.

Abstract of paper presented before the Wissenschaftlichen Gesellschaft fuer Luftfahrt

#### GERMAN AERONAUTICAL RESEARCH

Research Work of the DVL, W. Hoff. Royal Aeronautical Society Journal, Vol. 35, No. 249, September, 1931, pp. 771-802 and (discussion) 802-816, 57 figs.

THE range of aeronautical research carried on by the Deutschen Versuchsanstalt fuer Luftfahrt is discussed by the head of that organization. In taking up the work of the aerodynamical department the author shows the scheme of an elongation recorder used in determining the elongation in the structural members of an airplane in flight for the calculation of the actual air forces acting on it, and describes a seaplane equipped as a flying laboratory for testing floats, as well as the arrangement for observing propeller oscillation. He explains the means used by the stress department in measuring dynamic loads on airplane structures and the design of the optograph for recording the deflections of whole structural

He takes up the scientific work on engines and describes the new device for measuring the rate of combustion in engines and a torsiograph used in determining the torsional oscillations of a crankshaft. He concludes with brief reviews of the research conducted by the material, aerial photography and navigation, electrotechnical and wireless, and flight departments.

#### ENGINE COMBUSTION TESTS

Investigation of the Combustion Process in Spark gnition Engines with Electrical Methods of Investigation of the Composition 1 of the Configuration Engines with Electrical Methods of Measurement (Untersuchung von Verbrennungsvorgängen in Zündmotoren Mittels elektrischer Messverfahren), K. Schnauffer, Zeitschrift fuer Flugtechnik und Motorlutschiffahrt, Vol. 22, No. 17, September 14, 1931, pp. 526-530, 7 figs.

MEANS employed for investigating combustion in spark-ignition engines are discussed with particular reference to detonation. Oscillograms taken to determine the combustion speed and simultaneous pressure rise in the cylinder with detonation are shown and attention is called to the superiority of the electrical indicator of the

#### Elsa Gardner

Deutschen Versuchsanstalt fuer Luftfahrt for making these tests of high-speed engines.

The results proved that, without detonation, the combustion so took place that a flame proceeding from the spark plug ran through the combustion space at about uniform speed. With detonation, the last part of the highly compressed mixture fired simultaneously after attaining the self-ignition temperature. Through the simultaneous firing of larger parts of the mixture high temperature and pressure rises occurred with the immediate conversion of energy which followed so quickly and at such a high velocity, that strong local pressure differences occurred which were equalized with the velocity of sound. It was found that the intensity of the detonation depended on the amount of unburnt mixture existing in the combustion chamber at the beginning of detonation and on its composition, To measure the detonation, it is suggested that the exact immediate pressure rise be measured in the center of the detonation or that the quantity of mixture simultaneously reaching firing be compared with the composition of the mixture.

Paper presented before the Wissenschaftlichen Gesellschaft fuer Luftfahrt.

#### TORSION

Several Cases of Non-Circular Torsion Solved by Analysis and Direct Test, I. Orr. (British) Aeronautical Research Committee—Reports and Memoranda No. 1393, (Ae. 514), September, 1930, 8 pp., 5 figs.

A N arithmetical trial and error process for solving the torsion problem for any chosen boundaries is presented. By its use the torsion for several British Standard structural sections, a shaft with keyway, a hollow square, a hollow serrated shaft, a circular shaft enlarging to greater diameter, and a shaft with a collar is solved. These results are checked by tests in the case of the structural sections and hollow square by measuring both the twist and stresses. The failure of a prism subjected to high local stresses is also discussed.

## HEAVY-OIL ENGINES

Compression-Ignition Engines, H. T. Tizard. Aircraft Engineering, Vol. 3, No. 30, August, 1931, pp. 186, 196.

OMPRESSION-ignition and gasoline C OMPRESSION Ignition exemples are compared and opinions expressed regarding the chances of future competition between the two. After the limits of efficiency for the constant volume and constant pressure cycles are fixed, the effect on efficiency of combustion, partly at constant volume and partly at constant pressure, is examined. The author thinks it wrong to arrange the jet so that it travels in the same direction as the piston. He considers that the aim should be to inject fuel at right angles to the direction of motion of the pistons with the object of insuring that the fuel is mixed with unburnt air as it enters the cylinder. He takes up at length

the probable effects of supercharging on power and efficiency.

In the author's opinion, it is unlikely that the power-weight ratio of the normally aspirated four-stroke compression-ignition engine can be reduced sufficiently to compete with the gasoline engine for any length of flight reasonable under commercial conditions. He believes, however, that development of two-stroke engines working with initial pressures higher than atmospheric will end in the replacement of gasoline engines altogether.

DETONATION

Detonation, Spark Plug Position, and Engine oeed, R. O. King and H. Moss. Engineering, ol. 132, No. 3421, August 7, 1931, pp. 177-Speed, R. O Vol. 132, N 180, 15 figs.

THE experiments described were made on the Ricardo E-35 variable-compression engine in the Air Ministry Laboratory to determine the usable compression ratio. and the corresponding power developed depending on whether the spark plug position causes the flame movement to be toward the exhaust valves or the cooler inlet valves The relation between detonation and direction of flame movement was found to be involved with the effect of engine speed, and the scope of the experiments was extended to determine the factors underlying the usual effect of increase of speed to delay detonation

It is concluded that when ignition timing is adjusted for maximum power, the same output is obtained, whether the flame movement is toward the exhaust or inlet valves. The advantage of one direction over the other appears to rest on the comparative ability of valves and spark plugs to withstand overheating. Spark plugs placed at the exhaust-valve side of the combustion space tend to overheat in extreme conditions, and if placed at the inlet-valve side, the consequent completion of combustion at the opposite side tends excessively to raise the exhaust-valve temperature. These difficulties are reduced by placing the spark plugs at opposite ends of a diameter midway between the exhaust and inlet valves. Flame travel is then towards the middle, the time required for combustion is reduced because of shorter average length of flame travel, and a favorable effect on power is obtained.

AIRSHIPS The Latest French Airship Zodiac VZ-27 (Le dernier dirigeable Francais la vedette "Zodiac VZ-27"), M. Verneuil. Genie Civil, Vol. 99, No. 5, August 1. 1931, pp. 105-109, 10 figs., 3 tables. A ERODYNAMIC features of the Zodiac VZ-27 French three-lobe semi-rigid airship are discussed in detail. The body is divided into three lobes differing from a solid of revolution, but maintaining a plane of vertical symmetry passing through the longitudinal axis. The symmetry with regard to a horizontal plane is always less perfect, because the straight sections are egg-shaped by the effect of the pressure variations with height, the curves of the

surface changing under the effect of the (Continued on following page)

NOVEMBER, 1931

# Goodrich Scores Again

Another Thompson Trophy Winner chooses Goodrich Low Pressure Tires for High-Speed Landings . . . Take-offs





5:00 P. M. Labor Day. The waiting thousands at Cleveland's Airport suddenly become tense. The big moment of the greatest air show in history has arrived-the Thompson Trophy race.

The planes are at the starting line. ... Ready ...?

Down the field they streak. Like lightning. Split-seconds count. Now Bayles takes the lead. Keeps it. Faster . . . faster ... 200 ... 207 ... 222 ... 240 m.p.h.!

Before you realize it the suspense is over. Bayles roars over the line . . . winning the hundred-mile dash at an average speed of nearly four miles a minute. No one suggests that Bayles won this race because his plane was equipped with Goodrich Low Pressure Tires. This fact is, nevertheless, significant. Not only Bayles' plane, but the planes of his four nearest contenders, Williams, Jackson, Hall and Eacker, were each equipped with Goodrich Low Pressure Tires!

"This ship lands at approximately 85 m.p.h and is equipped with very positive brakes," writes Mr. R. L. Hall, Chief Engineer of Granville Bros. Aircraft, Inc., makers of the winning plane. "Yet Goodrich Low Pressure Tires have shown no sign of wear or failure even after landing in very rough fields at this terrific speed.

For further information on Goodrich Low Pressure Tires, phone your nearest Goodrich Distributor or write to the Aeronautical Department of The B. F. Goodrich Rubber Co., Akron, O., and Los Angeles, Calif.



# RUBBER FOR AIRPLANES

Another B. F. Goodrich Product

Over 40 rubber articles for airplanes - Silver-town Tires - Streamline Windshields - Tail Wheels - Hose - Tubing - Engine Mounts Crash Pads - Accessories



(Continued from preceding page) interior pressure and the shaping of a straight section, for example, decreasing with increase of pressure. The ship is powered with two 120-horsepower Samson engines, has a volume of 3,410 cubic meters, a total length of 45,500 meters and a width at the maximum cross-section of 10.94 meters.

The author quotes a formula of Jouglard, which gives an idea of the progress in the construction of airships, and includes tables showing relative values of lift coefficients for various bodies of revolution, coefficients of drag for different types of airships (the Astra-Torres, Los Angeles, and Mediterrance) and other characteristics of airships of the company and the characteristics of airships of the contracteristics of airships of the company and the characteristics of airships of the contracteristics of airships of the contracteristic

#### CORROSION PROTECTION OF MAGNESIUM ALLOYS

The Protection of Magnesium Alloys Against Corrosion, H. Sutton and L. F. LeBrocq. (British) Aeronautical Research Committee—Reports and Memoranda No. 1390 (M. 73), July, 1930, 22 pp.

A TTEMPTS to minimize the action of sea water spray on magnesium alloys are discussed. An alloy of magnesium with about 2 per cent manganese appeared somewhat more resistant to corrosion than commercially pure magnesium but the improvement in corrosion resistance was not great enough for many purposes. Sherardizing, calorizing, and the Schoop metal spray process all gave poor protection to the commonly used types of magnesium alloy. No increase in corrosion resistance appeared obtainable with the electric deposition of zinc or copper on commercially pure magnesium over that of the unplated metal, and the protective action of anodic films was poor.

An immersion process in which the work is immersed for 6 hours in a hot aqueous solution of potassium dichromate, potash alum, and caustic soda, appeared to be the best all around treatment for magnesium or magnesium alloy parts, especially when the work was subsequently coated with lanolin, or, preferably, enamelled.

#### FUELS AND DETONATION

Report on the Oxidation Characteristics of Fuel Vacuum with Regard to Engine Detonation, E. Mardles. Appendix by A. Egerton. (British) Reports and Memoranda No. 1374 (E. 46), November, 1930, 27 pp., 14 figs.

THE problem of what precisely happens when fuel molecules are acted upon by the oxygen of the air, and what precisely is the chain of reactions leading to the ultimate products of combustion, is discussed in a critical survey of the new information obtained on this subject and a summary of recent experiments carried out in the Air Ministry Laboratory. The author considers that the peroxide theory of combustion and detonation has been confirmed and strengthened by recent discoveries and that the action of anti-knocks and inhibitors can be traced to the removal or decrease in concentration of the active catalyst in the gaseous mixture undergoing combustion, since the rate of reaction appeared a function of this concentration. Inhibitors were invariably found to lower the temperature coefficient and accelerators to raise it. These findings are in accord with the conclusions of Tizard and Pye that the detonation tendency of fuels is dependent upon the temperature coefficient of gaseous reaction. A short critical review of various recent hypothesis regarding combustion is given.

#### SPINNING TESTS

Free Model Spinning Researches, A. V. Stephens. Aircraft Engineering, Vol. 3, No. 31, September, 1931, pp. 213-215, 4 figs.

THREE methods employed by the Royal Aircraft Establishment at Farnborough for investigating spinning are discussed, These include full-scale experiments in which the motion of an airplane performing in a spin is recorded by means of instruments inside the plane or on the ground, tests of captive models or parts of models rotating in a wind tunnel, and an investigation of dynamic models in free flight, It was found that in certain types of planes the rudder and fin surfaces were badly screened by the tail plane and fuselage at high angles of incidence, and six alternative tail units were constructed for the Bristol Fighter to examine the screening effects of the fuselage.

A vertical model wind tunnel consisting of an octagonal-section glass-walled tube, 2 feet in diameter and 5 feet high, is described as well as a vertical tunnel, 30 feet high and 12 feet in diameter which is now being constructed at the Establishment as a result of tests made on the model tunnel.

#### PERFORMANCE CALCULATION

Direct Adaptation of a Motor Propulsion Group by the Graphical Method with Logarithmic Scales, (Adaptation direct du groupe motopropulseur par la methode graphique a echelles logarithmique, G. Bilbault: L'Aeronautique, Vol. 13, Nos. 147 and 148, August and September, 1931, pp. 283-290 and 321-235, 42 figs.

T HE method described is based upon the logarithmic representations of Eiffel-Rith and is said to furnish a system for tracing a series of propeller groups so that the most suitable propellers may be selected in a few minutes practically without calculation but with great precision. In the first installment the author develops the fundamental theory and explains how the polar diagrams for airplanes and propellers are traced. In the second part, he deals with a number of specific cases, covering straightaway flight on the ground and at an altitude, both at maximum speed and also with reduced throttle, and climbing from the ground with the engine furnishing nominal power, the variable-pitch propeller being used in each of these cases. He concludes with four numerical examples.

#### AERODYNAMICS

Currents and Dynamic Actions at Very High Velocities, (Corrento e azioni dinamiche a velocità molto elevate), E. Pistolesi. Aerotecnica, Vol. 11, No. 6-7, June and July, 1931, pp. 701-729, 27 figs.

THE author examines the equation of motion in a fluid in which the compressibility is taken into account, and illustrates different types of currents with velocities more or less than that of sound. He takes up the problem of expansion around a sharp corner or curved wall, the phenomena of the compression wave, and the Prandtl and Raleigh formulas for stop pressures inside a pitot tube when the speed

to be measured exceeds that of sound,

He then passes on to a consideration of the dynamic action of a body moving at very high velocity and illustrates the behaviour of projectiles by means of drawings. He refers to the theoretical researches of Glauert on thin airfoils at high speeds below that of sound, and of Ackeret for ultra enormous speeds. In concluding, he discusses the results of experiments carried out in various countries on wings at high velocities and on propellers at high tip speeds, as well as those conducted by Stanton on a cylinder and by Pasqualini at the Royal School of Engineering at Turin on a sphere.

SEAPLANE LANDING IMPACT Contribution to the Question of Load Assumption for the Landing Impact of Seaplanes (Beitrag zur Frage der Belastungsannahmen füer den Landungsstoss von Seeflügeugen), J. Taub. Zeitschrifte füer Flügtechnik und Motorlufschiffahrt, Vol. 22, No. 14, July 28, 1931, pp. 433-442, 4 figs.

THE question of load assumptions for the landing impact of flying boats and seaplanes is discussed in this report of the Deutschen Versuchsanstalt fuer Luftfahrt. In the investigation, the influence of seaplane size on the percussion force, the ratio of the percussion force for flying boats and twin-float planes, and the ratio of the percussion force for the concentric and onesided landings of twin-float planes were taken up. An idea of surface loading of hulls or floats is introduced, and it is shown that by increasing the outlet of the airplane, the hull surface loading may be changed as the wing loading. The impact multiple for the one-sided landing of a twin-float seaplane was found to depend on the square of the ratio of eccentricity to the radius of gyration within the practical limits of 0.1 to 2.8.

The results obtained with the percussion force formulas developed by Pabst and Wagner are explained. Examples are given with numerical values for the large type Lanchester plane in which the surface loading remained unaltered and the large-type Rohrbach plane in which the surface loading increased with the cube root of the enlargening factors.

#### SEAPLANE HULLS

Mathematical Investigation of Strength of Wooden Seaplane Hulls of the Linton-Hope Type of Construction, (Full-Sized Machines-Third Series), W. C. S. Wigley. (British) Aeronautical Research Committee-Reports and Memoranda No. 1376 (Ae. 501), March, 1924, 18 pp., 4 figs.

A N investigation made at the request of the Seaplane Panel of the Aeronautical Research Committee into the strength of wooden seaplane hull of the Linton-Hope (P. 5) type is described. The longitudinal strength of the hull is calculated for two conditions, first supported at the ends, and, secondly, supported at the center of gravity, which are found to be satisfactory. In Appendix I are given the moduli of the timber employed in the construction of the P. 5 hull as measured by Dr. A. A. Griffith at the R. A. E., and in Appendix II as an experimental confirmation, the same methods of calculation are used to predict the crushing load of a Supermarine Seagull hull which was actually crushed at the Royal Aircraft Establishment.

# U. S. Aviation Brand Piston Rings contributed to the smooth operation of the 12 Curtiss-Wright "Conqueror" engines which powered the DO.X on its 12,000 mile flight

N August 27th more than fifty tons of airplane alighted on the waters of New York Bay after a leisurely flight of 12,000 miles begun at Lake Con-

stance, Switzerland, on November 5, 1930. The giant Dornier Do.X, largest airplane in the world, went sightseeing across Europe to Africa, over the South Atlantic to South America, and up the East coast by easy stages to New York, its destination. After 12,000 miles-over 300 hours of heavy duty operation under favorable and unfavorable conditions-the Do.X's twelve 600 h.p. Curtiss-Wright "Conqueror" engines are still in excellent condition. Oil consumption throughout the flight was remarkably low-only 1.66 quarts per hour for each engine. U.S. Aviation Brand Piston Rings share with Curtiss-Wright the honors of such mighty fine performance. There are four of these sturdy



This gives some idea of the number of U. S. Aviation Brand Piston Rings being used in the Do-X's twelve "Conqueror" engines. The two stacks at the left are compression rings and the five stacks at the right, oil control rings.

rings in each of the 144 cylinders of the twelve "Conqueror" engines. Not one ring failed to perform 100%! It has been demonstrated on many world-famous

flights—including those of Lindbergh, Chamberlin, Byrd, Boardman and Polando, and others—that U. S. Aviation Brand Piston Rings assure complete and continued sealing with a minimum amount of attention. The endorsement of numerous builders of famous engines is behind the selection of U. S. Aviation Brand Piston Rings for any internal combustion engine. ¶ Pilots prefer U. S. Aviation Brand Piston Rings for long distance and high speed flights. Demand these rings for the extra long life that is built into them, for their precision, true circle, perfect flatness and uniform wall thickness.

#### U. S. HAMMERED PISTON RING CO., Paterson, New Jersey



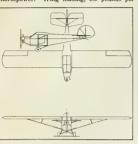
SOME INTERESTING FACTS CONCERNING THE DO.X

Capacity—160 passengers and crew of 10. Weight empty—64,900 lbs. Maximum weight—123,200 lbs. Maximum fuel capacity—36,300 lbs. Length—131.4 ft. Height—33.6 ft. Span—157.5 ft. Lifting area—5322 sq. ft. Power—12 Curtiss-Wright "Conquerors" of 600 h.p. each, giving a total of 7200 h.p. Engines mounted

on six nacelles, in tandem. Top speed-134 m.p.h. Cruising speed-116 m.p.h. Capable of flight with only eight of the twelve engines operating. Gasoline consumption—300 gallons per hour for the twelve engines at cruising speed. The hull of the Do-X has three decks; the lower deck is used for fuel and oil storage; the middle deck for passenger cabins, dining rooms, bounges, bar, kitchen, etc.; and the top deck for pilot's cabin, chart room, and rooms for the engineers and wireless operators. The crew, on the flight to the United States, consisted of a commander, first pilot, second pilot, navigator, wireless operator, 2 engineers, 6 mechanics and a operator, 2 engineers, 6 mechanics and

#### Approved Type Airplanes Now in Production (Continued from Oct. Issue of Aero Digest)

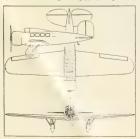
Specifications: Span, 37 feet 9.5 inches. Length overall, 21 feet 8.5 inches. Height overall, 5 feet 8.5 inches. Wing area (inoverall, 5 leet 8.5 inches. Wing area (including ailerons), 175 square feet. Model D-1, Continental A-40 of 38 horsepower; Model D-2, Szekely of 45 horsepower. (Model D-2): Power loading, 21 pounds per horsepower. Wing loading, 5.5 pounds per



Specifications: Span, 39 feet 9 inches, Length overall, 19 feet 5 inches. Height overall, 71 feet 8 inches. Wing area (including ailerons) 193 square feet. Cyclomotor of 22.5 horsepower at 2,350 revolutions per minute. Power loading, 20.1 pounds per horsepower. Wing loading, 3.5 pounds per square foot. Weight empty, 430



Specifications: Span, 42 feet 10 inches. Length overall, 27 feet 6 inches. Wing area Length overall, 27 feet 6 inches. Wing area (including ailerons), 294 square feet. Pratt & Whitney Wasp Type C of 450 horsepower at 2,100 revolutions per minute and 10:1 blower. Power loading, 11.56 pounds per horsepower. Wing loading, 17.7 pounds per square foot. Weight empty, 3,250 pounds;



#### **ALEXANDER** FLYABOUT D-1, D-2

Alexander Aircraft Company Colorado Springs, Colorado

square (oot. Weight empty, 582 pounds; useful load, 389 pounds; Payload, 190 pounds; gross weight loaded, 962 pounds. Performance: (Models D-1 and D-2, respectively) High speed, 80, 93 miles per hour. Cruising speed, 70, 80 miles per hour. Cruising speed, 70, 80 miles per hour. (Model D-2): Climb at sea level, 750 feet per minute. Service ceiling, 1,000 feet. Absolute capacity, 2, 2,000 feet. Cruising radius, 150 miles. Collonica capacity, 7 gallons. Oil capacity, 7 gallons. Oil

capacity, 1 gallon.

Both models are two-place light cabin monoplanes, identical except for the motor mount. The fuselage framework is of welded mount. The tusetage framework is of wieders seamless steel tubing covered with fabric. Wings are of conventional two-spar construction with single piece solid laminated spruce spars front and rear. There are two metal and five wooden drag struts per wing. Drag wires are of .080 aircraft steel. The wings are rounded with metal wing tips. The wings are braced to the fuselage with

two parallel tubular struts to a side, faired with wood, with auxiliary jump struts runwith wood, with auxiliary jump struts run-ning from each strut to the wing. Controls operate on a cable system. Standard equip-ment includes swiveled steel spring tail skid, staggered side-by-side upholstered seats, Pyralin inspection windows on the control system, dual controls, Goodyear Airwheels,



# CYCLOPLANE

Cycloplane Company, Limited Los Angeles, California

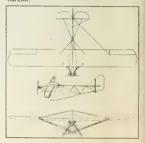
pounds; useful load, 240 pounds; gross weight, 670 pounds.

weight, 6/0 pounds.
Performance: High speed, 68 miles per hour.
Cruising speed, 60 miles per hour.
Landing speed, 20 miles per hour. Cruising radius, 200 miles. Gasoline capacity, 8 gal-

The framework of the fuselage is constructed of 1025 SAE steel tubing welded throughout. The fuselage is covered with fabric. The framework of the tail group and the ailerons is constructed of 4130 SAE and the ailerons is constructed of 4430 SAE steel tubing, welded and covered with fabric. The wings are built of solid spruce spars, unrouted, and truss type ribs of basswood, built up with double chord members. The leading edge of the wing is covered with 17ST sheet and the entire wing is fabric covered.

The landing gear is constructed of 4130 SAE steel tubing. There are provided 5 by 4 tires and wheel hubs designed by the Cycloplane company. A ten-inch coil spring is used in the shock leg. A steerable tail whel or a tail skid is provided as specified by purchasers.

The powerplant is a two-cycle, two-cylin-der opposed aircraft engine weighing sixty pounds complete with wooden propeller of sixty-two-inch diameter, magneto and car-



#### LOCKHEED ORION

Detroit Aircraft Corporation Detroit, Michigan

useful load, 1,950 pounds; gross weight, 5,200 pounds. Volume (including cabin and baggage compartment), 115 cubic feet.

Total horizontal area of the control sur-

Total horizontal area of the control surfaces, 62.5 square feet; total vertical area of control surfaces, 23.8 square feet. Performance: High speed, 220 miles per hour. Cruising speed (at 1,850 revolutions per minute), 175 miles per hour. Landing speed, 58 miles per hour. Gasoline capacity, 124 gallons. Oil capacity, 10 gallons. The Lockheed Orion is a seven-place low-wing cabin monoplane. Well streamlined

throughout, the plane is equipped with N. A C. A. cowling and cylinder bafflles, Lockheed retractable landing gear with oleo shock units, Goodrich semi-balloon tires and brakes. A tail wheel or tail skid is optional. Pro-peller is Hamilton-Standard.

Standard equipment includes landing lights and two parachute flares, automatic pres-sure fire extinguisher, cabin heater, naviga-tion lights, dome and cabin lights, and combination hand electric inertia starter. ship is bonded for radio.

Among the instruments provided are the following: magnetic compass, turn and bank indicator, tachometer, air speed indicator, rate of climb indicator, altimeter, clock, oil pressure and oil temperature gauges. Instrument lighting is indirect.



NOVEMBER, 1931

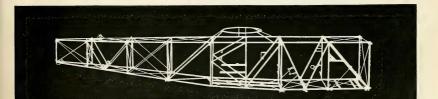


Speed! Unrelenting exaction of the utmost, hour on hour. Sudden acceleration—sudden diminution of headway. Instant reversals of strain on every part, either by the voluntary maneuvers of the pilot or by freaks and perversities of the elements. And nothing must sag or snap!

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NATIONAL-SHELBY AIRCRAFT TUBING



# BLACKBURN "SYDNEY"

HE Blackburn "Sydney" is a trimotor high-wing semi-cantilever military monoplane flying boat developed by the Blackburn Aeroplane and Motor Company, Ltd., London, England, for reconnaissance and coastal patrol. The ship is constructed entirely of metal with the exception of the fabric covering the wing and tail surfaces.

The plane is powered with three Rolls-Royce F. XII M. S. engines of 525 horsepower each, mounted in nacelles faired into the upper side of the leading edge of the wing. In each nacelle are a water tank and radiator with shutters, and an oil tank and cooler. The main gasoline tanks are carried in the faired portions between the hull, and the engines are supplied with fuel by engine pumps through distributor control.

The hull has a deep fore-front and is well flared to keep down spray. The sides of the hull above the water line are nearly perpendicular, giving as roomy an interior as possible. From the second step the lines sweep upward to the stern in which a tail defence machine gun station is provided.

The wing is supported above the hull at the center by a steel tubular structure built up on the hull and faired to form a streamline nacelle, and at the extremeties by the center section by two

pairs of sloping struts from the hull. The wing floats are set close to the hull and are supported by two pairs of struts from the center section, which bisect the wing bracing struts.

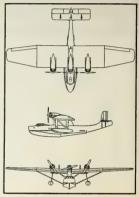
The tail plane is braced by two pairs of struts from the hull and fitted with trimming and controlling elevators. No fins are fitted and three rudders, which are unbraced externally, incorporate servo control which can be engaged or disenseared as required.

Accommodations are provided for a crew of five, comprising pilot, pilotnavigator, radio operator, engineer and gunner. The bow cockpit is arranged for machine gun, bombing, towing and mooring operations which are carried out by the navigator. Communication with the bow cockpit is through the control cabin which is completely enclosed. Two upholstered and adjustable seats are mounted side by side on a level higher than the central gangway. Dual controls for both flying and operating the engines are provided. The cabin is provided with sliding side windows and sliding panels in the roof through which an upward and rearward vision can be obtained.

Dividing the control cabin from the remaining interior compartments is a water-tight bulkhead through which

communication is provided by means of a door in the center. Behind this bulkhead on the port side is the navigator's station, and on the starboard side, the radio equipment. The navigator is provided with a chart table, revolving chair and space for navigation instruments. Mounted on the bulkhead on the Port side are a compass bracket, mirror and a clock. On the starboard side the radio apparatus is installed on a panel against the bulkhead and a table and chair similar to those for the navigator are provided.

Aft of the radio facilities is a settee berth, the back of which hinges upward, forming an upper berth. Locker space is provided underneath the lower berth. Three mahogany cupboards are installed on the port side. On the front of the rear main frame of the starboard side of this compartment is mounted an engine



Outline drawing of the Blackburn "Nile," commercial version of the "Sydney"

instrument panel with radiator shutter controls; this is the engineer's station which is fitted with two seats with locker space beneath. Sleeping quarters are installed aft of this compartment; three folding bunks, two on the port side and one on the starboard side are provided.

Further aft is an enclosed lavatory with a door on the port side. Behind these quarters are a cooking stove, ice chest and fresh water and paraffin storage tanks.

At the rear of this compartment is the aft machine gun cockpit below which is the gunner's platform; this platform has a hinged top which gives access to locker space beneath. Part of this platform hinges upward to permit communication with the after part of the hull and the tail defense station.

Complete official data on the Blackburn Sydney has not been issued. The span is 100 feet; height, 19 feet 2.5 inches; length, 65 feet 7 inches; wing area, 1,500 square feet; and weight loaded, 21,500 pounds.



Reconnaissance and coastal patrol boat produced by Blackburn

# A SURE CURE FOR PRE-IGNITION, OR SOOTING OF SPARK PLUGS

The AC heat range system puts in your hands a simple, scientific basis for correcting spark plug troubles. It shows you how to select the most efficient spark plug for every type of service—plugs that will not soot or foul when you make short hops or fly at half throttle much of the time, or that will not cause pre-ignition when you make long flights at full throttle.

This system for fitting spark plugs to individual flying requirements employs AC Miko spark plugs in seven gradations of insulator length. When you find indications that a plug has been running too hot, you merely change to a plug with shorter insulation exposed to the combustion temperature. Likewise, you choose a plug with more exposed insulation when your plugs have not been running hot enough to keep themselves clean. The method is simple, the results are certain.

Ask your AC representative or jobber's salesman, or write direct to the factory, for the new AC heat range specification charts, covering all aircraft engines.

AC SPARK PLUG COMPANY FLINT, MICHIGAN



# THE AIR SERVICES

#### SERVICES AWARD NEW CONTRACTS

ONTRACTS involving a combined total of \$2,747,265 were awarded on October 9 to aeronautical manufacturers by the War and Navy Departments.

The Army Air Corps receives under the terms of the contracts fifty-three new air-craft and 100 aircraft engines, involving a total of \$1,931,953. A total of thirty-one new planes was purchased by the Navy. Department at a cost of \$815,312.

The Air Corps awards brought the total number of new airplanes purchased this calendar year to 551 and the number of engines to 1,070. Since January 1, of this year, expenditures for new Air Corps equipment have agreeated \$16.747.317.

The largest order in the most recent purchases went to the Douglas Aircraft Company, Inc., Santa Monica, Calif. The company will supply to the Air Corps eighteen observation planes for National Guard use in addition to five single-engined observation monoplanes; five twin-engined metal observation planes and seven metal, twin-engined light bombardment ships, all for actual service tests, at a cost of \$71.8875.

Thirteen attack planes and spare parts, costing \$427,615, will be supplied by the Curtiss Aeroplane and Motor Company, Inc., Buffalo, N. Y.

Contract for five pursuit ships and spare parts, costing \$172,609, was awarded by the War Department to the Detroit Aircraft Corporation. These ships are Lockheeds of the two-place pursuit type, powered with Curtiss V-1570-E direct drive engine. The Pratt & Whitney Aircraft Company of Hartford, Conn., received a contract for 100 Hornet R-1860-B engines and spare parts, at a total cost of \$612,854.

The Navy Department contracts announced last month were awarded to the Chance Vought Corporation of Hartford, Conn., and the Glenn L. Martin Company, Baltimore, Md. The Chance Vought company will supply fifteen observation planes, type 03U-2, and spares at a total cost of \$280,650. The Martin company was awarded a contract for sixteen bombing planes, BM-2 type, and spare parts for \$534,662. BM-2 type, and spare parts for \$634,662. BM-2 type, and \$644,662. BM-2 type, and \$644,662.

Airship Akron Completes Tests

THE minth and last of a series of flight tests by the new airship Akron was successfully completed at Akron, Ohio, October 18. The tests were made by navy personnel following completion of the airship by the Goodyear-Zeppelin Corporation and were designed to test every detail of construction before acceptance of the craft by the Navy Department. The final flight comprised a cruise of forty-eight hours and eighteen minutes over the Middle-West.

Air Corps Aerial Photographic Tests
AERIAL photographs of mountain ranges
200 miles distant have been taken by Air
Corps squadrons stationed in Hawaii, the
War Department recently announced. Successful results were obtained by a member
of the 11th Photo Section, using standard
equipment and flying at an altitude of 11,000
feet.

Photographs of a parachute jumper during the descent from an airplane in flight were recently made by the jumper himself, the War Department reported. A common box-type camera was used.

THE aircraft carrier Lexington recently established a speed record for ships of her size on a run from the Bremerton Navy Yard to San Pedro, Calif., the Navy Department has announced. The 896-foot vessel attained a maximum speed of 33.7 knots, or forty-one miles per hour.

#### General Fechet on Tour

AS ONE of his last official acts, General James E. Fechet, retiring Chief of the Army Air Corps, has started an aerial tour to visit every aviation military post in the country, surveying the general housing situation at each field. The tour is being made with Representative W. Frank James, Chairman of the House Military Affairs Committee. A latest type Air Corps transport equipped with two-way radio telephone is being used on the nation-wide flight.

General Fechet will retire soon and will be succeeded as Chief of the Air Corps by General Benjamin D. Foulois, assistant chief.

CONSTRUCTION of an all-metal fitty-five-foot airplane wing has been completed at Wright Field, Dayton, Ohio, by an Air Corps officer after much research, the War Department recently announced. The design is said to be such that the wing is considerably stronger than the usual cantilever wing.

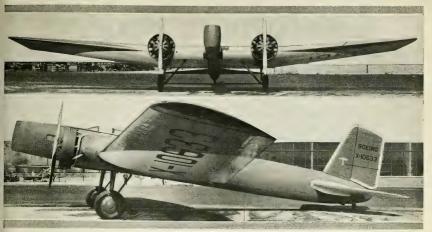
#### Randolph Field Opens in November as Air Corps Primary School

RANDOLPH FIELD, the "West Point of the Air," near San Antonio, Texas, will begin functioning as the new training center of the Army Air Corps on November 2, when a class of 200 students will enter upon an eight-month course of primary flight training. Brooks field at San Antonio, and March Field, Riverside, Calif., primary flying schools of the Air Corps, were to cease functioning as such in the latter part of October. Among the 200 students constituting the first class at Randolph Field are twenty-two members of the June, 1931, graduating class of the United States Military Academy.

BIDS for the construction of the National Guard Air Service hangars at the Boston Municipal Airport, Boston, Mass., were recently opened by the Armory Commission. During the period of construction at the field following the award of the contract, the squadron based at the field will make its operations headquarters in the American Airways hangar at the airport and five of the planes will be hangared there. Planes placed on an inactive status will be housed at the Naval Air Station, Squantum, Mass.



Latest type of Curtiss Falcon 0-39 observation biplane for Army Air Corps, powered with Curtiss Conqueror 600-horsepower water-or Prestone-cooled engine



New Boeing all-metal bomber for Army Air Corps, equipped with retractable landing gear and powered with two Hornet engines, carries a crew of five and can transport two 1,000-pound bombs

#### Boeing Reports on Aircraft Production for Services

TEN Wasp-powered pursuits have been delivered on the contract for 135 P-126 ingle-seaters which the Army Air Corps has awarded the Boeing Airplane Company, Seattle, Wash., and twelve more were scheduled to be delivered during the latter part of October.

Sixty-three of the pursuits are scheduled for delivery to Army Air Corps bases in Hawaii, Panama and the Philippines. The remainder will be flight-delivered from Seattle to the various Army Air Corps fields throughout the United States.

Two bombers have been completed and are ready for delivery to the Army Air Corps on the recent contract for seven twinengined, all-metal bombers being produced by the Boeing company. One of the bombers is powered with geared Hornet engines, while the other has liquid-cooled engines installed.

The Boeing company plans to deliver before January 10, 1932, the first twenty of the seventy-five fighters ordered by the navy. This production schedule has been set up because the navy desires that number of planes to be attached to one of the airplane carriers participating in the midwinter cruise of the Battle Fleet. The fighters are of the latest type in the Boeing series of fighters which have been used by the navy for the past four years.

#### Building of Second Super-Dirigible Pends Success of Akron Tests

T HE economy plan of the navy to meet the \$60,000,000 reduction in the 1932-33 budget called for recently by President Hoover does not contemplate the elimination of the second super-dirigible of the navy of which the Akron is the first, Charles Francis Adams, Secretary of the Navy, has announced. Congress has appropriated \$1,200,000 toward the construction of this airship.

Plans of the Navy Department are to go ahead with the construction of this airship if the trial flights of the Ahron prove satisfactory. If these official tests are met, the second dirigible would be in the revised budget and the Goodyear-Zeppelin Corporation would proceed with the ZRS-5, the second airship. The contract price for the ZRS-5 was \$2,450,000.

Bids for the construction of a dirigible hangar at Sunnyvale; Calif., which will house an airship of approximately 11,000-000 cubic feet were recently opened by the Navy Department. The new hangar, which will serve as a Pacific Coast airship base, will be 1,138 feet long, 310 feet wide and 198 feet high. The total cost of the entire base as authorized by Congress is set at \$5,000,000.

PERSONNEL of the Naval Aircraft Factory, Philadelphia, Pa., recently flew from the factory to the plant of the Pratt & Whitney Aircraft Company, Hartford, Conn., to study the types of P. & W. engines installed in the 02C-1's. The construction of the engines was inspected from the casting to the finished product and the mechanics were then instructed in making twenty-hour checks and overhaul. The flight was made in three 02C-1's in formation and required one hour and fifty minutes each way.

CONSTRUCTION work is in progress on a second dirigible hangar, located 1,300 feet east of the present hangar, at the U. S. Naval Air Station, Lakehurst, N. J. The maximum height of the structure when completed will be 100 feet.

SPARE PARTS for F2B-1 Wasp-powered fighting planes of the Navy have been ordered from the Boeing Airplane Company by the Naval Air Station, Pensacola, Fla. The F2B-1's, which were the first single-seater fighters with air-cooled engines to be built for the Navy by the Boeing plant, were delivered in 1927.

TWO NEW contracts have been awarded the Switilk Parachute & Equipment Company by the Army Air Corps, company officials recently reported. One contract called for twenty-six parachute training outfits, each consisting of a back pack and chest pack; and the other, for 507 winter flying suits. The suits are of a new design effected by the Air Corps personnel at Wright Field and are said to be entirely new in flying togs.

Stanley Switlik, president of the company, reported that 1931 to date has been the best year in the history of the company. A number of army and navy contracts has been received this year, in addition to civil business.

#### Airplanes Make Night Contacts with Los Angeles in Flight

AIRPLANE contacts at night with the airship Los Angeles were recently accomplished, the Navy Department has announced. Previously this maneuver had been limited to daylight flying. The night contacts with the cruising airship were made by two naval fliers in training as heavier-than-air pilots for the new airship Abron. A number of contacts was completed. Hook-on and take-off experiments are regarded by the Navy Department as distinctly an American accomplishment, similar tests believed to have never been tried by other nations.

# AERONAUTICAL INDUSTRY

#### DIGEST OF RECENT EVENTS

A Brief Chronological Summary of the Month's Important Aeronautical News

#### New-Type Plane

(France.) The invention of an airplane equipped with telescopic wings, designed to permit the wing area to be reduced progressively in flight as fuel is used up and weight diminished, was, announced by Ivan Makhonine, a Russian engineer living in Paris. (Sept. 25)

#### Graf Zeppelin

(Brazil.) The German airship Graf Zeppelin left Pernambuco on a return trip to Friedricshafen, following a regular schedule of transatlantic flight. On the flight to Germany, the airship approached the 200,-000-mile mark of air travel. (Sept. 25)

#### Seaplane Record

(England.) Using a new fuel and an engine built solely for the test, Flight Lieutenant G. H. Stainforth established a new world's seaplane speed record of 408.8 miles per hour average in five runs over a three-kilometer course on the Solent in a Supermarine SoB seaplane. His fastest lap was 415.2 miles per hour. (Sept. 29)

#### Glider Flight

A distance of twenty-six miles from Leroy to Rochester, N. Y., was flown in a motorless aircraft by W. Hawley Bowlus. The flight was completed in forty-five minutes. (Sept. 30)

#### State Air Laws

State air laws prohibiting the operation of planes not licensed by the U. S. Department of Commerce became effective in New York and New Jersey. All unlicensed pilots and all planes without Airworthiness Certificates were grounded. (Sent. 30.)

#### Night Air Contacts

Airplane contacts at night with the navy airship Los Angeles have been successfully completed by two navy pilots, the Navy Department, Bureau of Aeronautics, announced. Previously, Planes had taken off from and hooked onto the airship only in the day time, (Oct. 1)

#### High-Altitude Plane

(Germany.) Initial test flights of a Junkers plane designed for high-altitude flying were conducted. The tests did not comprise flights at high altitudes; these are to be undertaken in the future. (Oct. 2.)

#### Japan-U. S. Flight

The first non-stop flight from Japan to the United States was completed at Wenatchee, Wash., by Clyde Pangborn and Hugh Herndon, Jr., in a Bellanca monoplane. They flew from Samushiro Beach across the Pa-

cific, covering the distance of 4,877 miles in forty-one hours and thirteen minutes. The landing gear was dropped after the take-off to decrease wind resistance. A successful landing at Wenatchee was accomplished. They left New York on July 28 on a projected world flight to establish a new record. A damaged wing at Khabarovsk, Siberia, forced the fliers to abandon the attempt at the world record. They continued to Tokio with the plan of making the Japan-United States flight. (Oct. 5.)

#### S. A. E. Meeting

The production meeting of the Society of Automotive Enginers was held at the Book-Cadillac Hotel, Detroit, Mich. (Oct. 7-8.)

#### Robot Plane Pilot

The first civilian demonstration of the Sperry automatic pilot was conducted at Newark Airport, N. J. The device has been installed on an eighteen-passenger Curtiss Condor for the purposes of demonstration to civil aviation and a series of tests will be made. Following successful experiments with the automatic pilot conducted by the Army Air Corps and the Naval Air Service for several years, the Sperry company, manufacturer of the robot pilot, received permission for the new tests. (Oct. 7.)

#### Air Pageant

The First Annual All-Southern Aircraft Pageant was held at Charlotte, N. C. (Oct. 8-11.)

#### Air Service Contracts

Contracts involving a combined total of \$2,747,265 were awarded to acronautical manufacturers by the War and Navy Departments. Under the terms of the contracts, the Air Corps will receive fifty-three new aircraft and 100 new aircraft engines, involving a total cost of \$1,931,953; and

the Bureau of Aeronautics, thirty-one planes at a total cost of \$815,312. (Oct. 9.)

#### Largest Amphibion

Sponsored by Mrs. Herbert Hoover, the American Clipper, largest amphibion in the world and the largest commercial airplane ever constructed in the United States, was christened in ceremonies held at the Naval Air Station, Anacostia, D. C. The ship was built by the Sikorsky Aviation Corporation for Pan American Airways which will place the craft in regular air transport service on the Latin American division of the company's airlines. (Oct. 12.)

#### U. S.-Venezuela Flight

A good-will flight of 5,000 miles from the United States to Venezuela was started at Roosevelt Field, N. Y., by George Pocaterra, pilot, and L. Hoover, mechanic, in a Stearman biplane. They planed to fly to Caracas, Venezuela, via St. Louis, Tulsa, Brownsville, Mexico City, and Guatemala City. (Oct. 14.)

#### Air Safety

Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, addressed the Twentieth Annual Safety Congress at Chicago, Ill. Discussing the problems of safety in aeronautics, Colonel Young attributed the "present gratifying condition of civil and commercial aeronautics" in a large degree to the safety measures which are being employed. (Oct. 16.)

#### Four-Field Air Show

A four-field air show was held in the area of New York City to raise funds for the benefit of the unemployed. Military and commercial pilots participated in a number of aerial exhibitions. A feature of the show was the airplane ferry service for the general public between the four airports and sight-seeing flights over New York. The entire proceeds were donated to the Emergency Unemployment Relief Committee. The show was staged at Roosevelt Field, Floyd Bennet Field, Curtiss-Wright Airport and Glenn H. Curtiss Airport, (Oct. 17-18.)



Acme Pho

Pangborn and Herndon about to land at Wenatchee, Wash., on flight from Japan without landing gear which they dropped to decrease air resistance

#### Pangborn and Herndon

Clyde Pangborn and Hugh Herndon, Jr., landed at Floyd Bennett Field, Brooklyn, N. Y., completing a 'round-the-world flight which started at the field more than two months previously. In the course of the flight they completed the first non-stop aerial crossing of the Pacific from Japan to the United States. (Oct. 17.)

#### Graf Zeppelin

(Germany.) The airship Graf Zeppelin left Friedrichshafen on a commercial flight to Pernambuco, Brazil. The airship carried seventeen passengers and was under the command of Capt. Ernst Lehmann. (Oct. 17.)

#### A.S.M.E. Air Meeting

The Aeronautical Division of the American Society of Mechanical Engineers met at Philadelphia, Pa., in conjunction with the Engineers Club of Philadelphia and the Aero Club of Pennsylvania. The program included an inspection trip to the Pitcairn Aviation Field and a dinner and technical sessions at the Engineers' Club. (Oct. 20.)

#### Airship Akron

Following the successful completion of a number of test flights by a navy crew, preliminary acceptance of the Akron, the world's largest airship, was approved by Charles Francis Adams, Secretary of the Navy, who announced simultaneously that the construction of the Akrons's sitest ship, the ZRS-5, would be started immediately by the Goodyear-Zeppelin Corporation. The last test flight comprised a cruise of forty-eight hours and eighten minutes over the Mid-West. (Oct. 20.)

#### Canada-Mexico Flight

A flight of approximately 2,500 miles from Ottawa, Canada, to Mexico City, Mexico, was completed by Major James H. Doolittle in a total flying time of eleven hours and forty-five minutes at an average flying speed of 212.7 miles per hour. Total elapsed time was twelve hours and thirty-six minutes, stops for refueling being made en route at Washington, D. C., Birmingham, Ala, and Corpus Christi, Texas. (Oct. 20.)

#### Akron at Lakehurst

The navy airship Akron flew from Akron, Ohio, to the Naval Air Station, Lakehurst, N. J., where it will be based in the service of the navy. (Oct. 22.)

#### Lindherahs

Colonel and Mrs. Lindbergh landed at Newark Airport, N. J., on a flight from Victoria, B.C., in thirty-nine hours and twelve minutes elapsed time. They recently left China where they had been aiding in tood rescue work by making aerial surveys, and sailed for Victoria. The Lindberghs had intended to fly back in easy stages, but the sudden death of Senator D. W. Morrow, Mrs. Lindbergh's father, changed their plans and they started at once, sailing from Tokio. (Oct. 23.)

#### Renefit Air Moet

An air meet for the benefit of the unemployed was held at the Jersey City Airport, Droyer's Point, N. J. (Oct. 23-25.)

#### THE TRENDS IN AIR TRANSPORTATION

T HAT the American public has a greater practical interest in flying than in any previous time in the history of aeronautics, is the opinion of Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, based on observations made during a recent 6,500-mile inspection tour of the Federal airways system.

Air transportation is on a strictly business basis, Colonel Young asserted, and the romance of successful pioneering alone remains. Users of air transportation employ it primarily because it means a saving of time and money and there is an ever-in-creasing number of "repeating" air travelers.

"Another impressive observation," Colonel Young stated, "was the trend toward a higher standard of aircraft used for miscellaneous puposes such as student instruction, air taxi work, private flying and various non-scheduled industrial operations. The old stock, the obsolescent types, are not so much in evidence at the airports and landing fields. The newer equipment is better maintained, is more efficient and in general gives an impression of a healthier and more secure condition of the miscellaneous phase of flying.

"Practically all scheduled airline opera-

tors are anticipating the production of aireraft with higher cruising speeds, for two outstanding reasons: First, even though scheduled air transportation is three to four times faster than surface methods, the public is beginning to demand an increase in cruising speed; second, higher cruising speeds will reduce per mile cost of operation."

Colonel Young stated that two-way radio communication is showing a most gratifying development. In flight it is possible to communicate with pilots flying hundreds of miles distant as well as with radio ground stations, and to receive regularly Department of Commerce weather reports on halfhourly schedules.

In addition to this weather reporting service, the Federal airways system includes Department of Commerce intermediate landing fields located at forty to fifty-mile intervals; beacon lights at ten to fiften-mile spacings; radio range beacons which provide radio signals to guide a pilot along the airway and keep him from straying off the course; and radio marker beacons to warn him of obstructions along the airway or to mark the intersection of adjacent radio beacon beams.

# AND PILOTS ON INCREASE

NCREASES in the number of licensed pilots and aircraft during the third quarter of this year were announced recently by the Aeronautics Branch of the Department of Commerce. There were 17,242 pilots, 10,609 aircraft and 9,166 mechanics holding active Department of Commerce licenses on October 1. This is in comparison with July 1 of this year when there were 16,268 licensed pilots and 10,235 licensed aircraft. During this period the number of mechanics decreased 50.

In all, there were 6,722 transport, 1,709 limited commercial, 54 industrial, and 8,757 private pilots and 296 glider pilots on October 1. Among the 17,242 persons who held these pilots' licenses there were 476 women, of whom 35 were transport, 54 limited commercial, one industrial and 386 private pilots. The group of licensed mechanics included five women.

In number of licensed pilots, California led with 3,220, New York was second with 1,811, and Illinois third with 1,121. California led the list of licensed mechanics with 1,664. New York had 880 and Illinois 559.

The State of New York had the greatest number of licensed and unlicensed aircraft, 1200. California was second with 1.175 and Illinois third with 744. With respect to licensed planes, however, California had 957, New York 927, and Illinois 505. New York had the greatest number of unlicensed aircraft, 273. Illinois had second with 239, and California third with 218.

Gliders on record totaled 1,272 of which 111 were licensed and 1,161 unlicensed. The study showed California to be in the lead with 261 gliders and 114 licensed glider pilots. Second place went to New York with 127 gliders and 45 pilots, and third place to Michigan, with 122 gliders and 20 pilots. Illinois was shown to have 18 glider pilots and 77 gliders, while Ohio had 107 gliders and 16 pilots.

#### Licensing of Pilots of Unconventional Types of Aircraft Provided

PROVISION for the licensing and rating of pilots of unconventional types of aircraft is being made by the Aeronautics Branch of the Department of Commerce, officials recently announced.

Conventional aircraft are defined by the Aeronautics Branch as being those types of heavier-than-air aircraft which depend for sustentation upon fixed planes and which are controlled by trailing tail surfaces. Those types which do not conform to this definition are classed as unconventional.

Pilots who now hold transport and limited commercial licenses, which entitle them to carry passengers for hire in conventional aircraft, may also carry passengers for hire in unconventional types upon passing a flight test designed to ascertain their ability to fly such aircraft. Their authority to carry pay passengers in both types of aircraft will be indicated on a rating sheet which forms a part of the license and is carried by the pilot. The new sheet will be substituted for the old as rapidly as pilots' licenses are renewed.

Licensed pilots who now hold regular licenses in the grades below limited commercial and transport may fly unconventional types without the rating, which is applicable only to the grades of license which permit the carrying of passengers for hire.

Pilots who have received their training

in unconventional types of aircraft and who do not have regular licenses will be issued separate special licenses.

#### Air Violations Total 438 in Third Quarter

THERE were 438 violations of the Air Commerce Regulations dealt with by the Aeronautics Branch of the Department of Commerce during the third quarter of 1931, according to a recent announcement of Gilbert G. Budwig, Director of Air Regulation. The total violations of the regulations for this period represented an increase of 128 over the second quarter of the year. Fines totaling \$370 were assessed against eighty-nine persons and collected, and \$747 were collected on civil penalties previously assessed. Penalties in the form of sixtyone reprimands, 108 suspensions, thirty-six revocations and seven denials of licenses were imposed for violations. In 137 cases. evidence was produced which justified dismissal.

Violations of the Air Commerce Regulations dealing with low flying led the list of specific offenses. There were 103 violations of the low flying provisions and seventy-five of the acrobatics clause of the regulations.

THE question of safety in aeronautics was discussed by Col. Clarence M. Young, Assistant Secretary of Commerce for Aeronautics, in an address delivered October 16 at the Twentieth Annual Safety Congress of the National Safety Council, held at Chicago, Ill. Colonel Young said that the problems of safety in air transportation is no different, fundamentally, from the safety problems of other means of transport. He discussed in detail the measures which have been taken to promote safety in aerial transport. He accredited "the present gratifying condition of civil and commercial aeronautics in the United States" in a large degree to the safety measures that have been and are constantly being employed.

#### NORTHEAST

MAINE AIR TRANSPORT recently reported 3,923 passengers carried in the five and one-half months from May 1 to October 15. The estimated number of miles flown during that period is close to 50,000. The peak of the season was reached in September when traffic averaged between fifty and sixty passengers a day, most of it on the scheduled trips to North Haven and Vinal Haven. The mid-day trip was taken off October 1 but the islands will continue to have plane service to the mainland morning and afternoon.

PAN AMERICAN AIRWAYS' seaplane base of operations at Calais, Me, used in its international service between Boston and Halifax, N. S., has been designated a temporary airport of entry.

AN international air meet has been held at the Caribou Municipal Airport with a number of races and contests. More than two dozen planes from New England and Canada participated in the events. The airport was named a temporary airport of entry.

THE Southern New England Flying Service, Inc., was recently granted a charter to operate out of What Cheer Airport, Pawtucket, R. I. The incorporators are Joshua Crane, Jr., North Quincy, Mass, Percy B. Berby, Boston, Mass., and Ray Morrison and Boyd S. Howland of Pawtucket, R. I. The corporation is authorized to own, operate, lease and control airports, deal in and operate airplanes, carry passengers for hire and conduct aviation schools.

THE establishment of the Kellett Autogiro Agency in Boston, Mass., has been
announced by the A. D. M. Corporation,
which has established this agency under
appointment by the Kellett Aircraft Corporation of Philadelphia, licensee of the
Autogiro Corporation of America, which
hold exclusive rights to the Cierva patents
in the United States. The field headquarters for the Kellett Autogiro will be Wellesley-Natick Airport where complete facilities
for demonstration and service will be maintained. Herbert C. Mayer is president of
the A. D. M. Corporation and Martin
Dodge is secretary-treasurer.

#### COMING AERONAUTICAL EVENTS

October 27-29. Ninth National Transportation Meeting of the S. A. E., Shoreham Hotel, Washington, D. C.

November 11. Thirteenth Annual Armistice Day celebration.

November 15-22. Second Annual Baltimore Aircraft Show and Industrial Exhibition, Service Field Airport, Baltimore, Md.

November 22-December 5. Glider Contest, auspices Honolulu Chapter of the N. A. A., Honolulu, Hawaii. Postponed from October 22-November 5.

November 26-29. Charlotte Sportsmanship Air Pageant featuring Al Williams, Charlotte, N. C.

January, 1932. Miami All-American Air Races, Miami, Fla., definite date pending.

January 14, 1932. Annual Dinner of the S. A. E., Pennsylvania Hotel, New York.

January 25-29, 1932. Annual Meeting of the S. A. E., Book-Cadillac Hotel, Detroit, Mich. JOSHUA CRANE, Jr., president of the Dennison Airport, Inc., Quincy, Mass., and associates have taken over the unexpired lease to the What Cheer Airport, Pawtucket, R. I., formerly held by the Curtiss-Wright Flying Service.

Kurt Langborg, former chief pilot for the defunct Rhode Island Flying Service, will be chief pilot of the new company, assisted by Ray Morrison. Boyd Howland of Dennison is mechanic.

THE Curtiss-Wright Flying Service base at Rockland, Maine, announced recently the appointment of Samuel D. Irwin as manager.

GEORGE CHAPLINE, director of sales and service for the Wright Aeronautical Corporation, Paterson, N. J., recently announced that a new Wright Cyclone engine of 625 horsepower was recently installed in the Curtiss Command "Helldiver," used by David A. Ingalls, Assistant Secretary of the Navy for Aeronautics. The new engine is similar to the Cyclone of 575 horsepower with which Secretary Ingalls' plane was previously powered, but the compression ratio is 6.25:1 instead of 5.1:1 as in the standard models.

UNDER the recent change in policy announced by J. S. Allard, president of the Curtiss-Wright Flying Service, one of the first moves was to clarify and to define sales territories, including changes in personnel at a few of the thirty bases located throughout the United States.

"The independent operator can profitably carry on certain phases of airplane operation," Mr. Allard stated, "but he cannot afford to maintain terminal facilities and service equipment in a manner comparable with that in which the Curtiss-Wright Flying Service has invested so much to maintain. Therefore, wherever possible, it will be the policy to interest independent operators in those operations which they can successfully handle, offering them the terminal facilities and service work of the Curtiss-Wright Flying Service but curtailing operations at certain points where we have been competing with operators who are our customers and who we feel can handle this work more economically than we can."

A rearrangement of sales territories under district managers was recently completed by the company.

A ROUND-TRIP rate of \$20 between Washington and New York over the Eastern Air Transport System became effective October 15, reducing the air fare one-third below the former price. The round trip rate also applies to Baltimore, and reductions in one-way tariffs went into effect on the same date.

The reduced fares are effected, company officials said, through a large increase in passenger volume over this section of the company's 2,378-mile airway; the number of persons flying having trebled since January 1.

FOUR AIRPLANE services a day from New York to Pittsburgh at intervals of two hours are the new schedules of Transcontinental & Western Air, Inc., which went in effect September 28. The planes leave Newark Airport at 8.45 a. m., 10.45 a. m., 12.45 p. m. and 2.45 p. m., making stops at Philadelphia and Harrisburg and arriving at Pittsburgh at 12:30 p. m., 2:30 p. m., 4:20 p. m. and 6:20 p. m.

The first plane leaving New York in the morning and arriving at Pittsburgh at 12:30 p. m. will continue westward at 12:40 p. m. and flying via Columbus, Springfield, Dayton and Fort Wayne, will arrive in Chiega at 4:45 p. m., offering eight-hour service from New York to Chicago.

A CHECK for \$3,600 to the American Red Cross and another check for \$3,600 to the German Red Cross were presented recently by J. S. Allard, president of the Curtiss-Wright Flying Service.

These checks represent the proceeds from the sale of tickets admitting the public to inspect the Dornier Do.X which is pulled up on shore at the airport and charging an admission of fifty cents per ticket.

WILLIAM L. WADEMAN, president of the Wademan Flying Service, was recently appointed New-York and Pennsylvania distributor of the new Tank Aero Engine, an air-cooled "V" engine of 115 horsepower.

STATE air laws prohibiting the operation of planes not licensed by the U. S. Department of Commerce, Aeronautics Branch, became effective on September 30 in the States of New York and New Jersey. Planes must have Airworthiness Certificates to operate within the boundaries of these states. All unlicensed pilots will be grounded.

OLIVER A, GOTTSCHALK has been made general traffic manager for Eastern Air Transport, Inc., Brooklyn, N. Y., replacing Ralph S. Westing who recently resigned, according to a recent announcement of Harold A. Elliott, vice president and general manager. Mr. Gottschalk formerly was assistant general traffic manager.

AS A MEANS of encouraging flying on their various operations throughout New Jersey, the Aeromarine Klemm Corporation, Keyport, N. J., offers any person who obtains his student permit after taking a dollar flight at one of their airports a twentyminute lesson of instruction free.

"It is very much worth while to have as many people as possible possess student permits," the announcement of this plan stated, "so that they will be a part of the aviation fraternity rather than just occasional filers. If the idea of urging people to obtain student permits were carried out at all fields, the number of permits purchased would greatly increase, and the fields would be afforded a rather more steady source of income. Some of the prospective filers might not fly very often, but at any rate they would eventually learn to fiv."

IN ORDER to spend at least twelve hours in each of sixteen cities in the Middle-West during a period of a little more than two weeks, Robert Wood Johnson, general manager of the surgical dressing house of Johnson & Johnson, New Brunswick, N. J., recently purchased a Pitcairn autogiro of the latest design in which to make the tour. The purpose of Mr. Johnson's flight is to make an intensive survey of economic and business conditions throughout the Middle-West.

#### Develop Parking Brake

A NEW device installed on the American Airways' Pilgrim nine-passenger transport plane eliminates the use of wheel chocks, which have heretofore been considered an essential part of airplane equipment. The device is a parking brake which locks the plane and enables the pilot to warm up the engine, or race it, without getting under way. With the throttle wide open the plane will not move, it is reported.

Among the advantages are the elimination of the necessity for a ground crew to stand by to pull out the chocks when the plane is ready to take off. The device permits the pilot to take off without ground assistance. The new brake on the Pilgrim is designed to be fool-proof. It is operated by a toe pedal, but the locking mechanism is worked by hand. The pilot must first press down on the pedal, then pull a ring on the instrument board, then release the pedal. A second pressure of the foot releases the brake.

THE industrial sales department of the Westingbouse Electric & Manufacturing Company, East Pittsburgh, Pa., has been reorganized under the direction of O. F. Stroman, industrial sales manager, the com-

pany has reported. The reorganized department is composed of units grouped according to the main classifications of industry.

Two assistant sales managers and fourteen divisional managers have been appointed and the new organization also provides for the grouping of specialized engineers with every sales division.

Bernard Lester and C. B. Stainback have been appointed assistant sales managers.

WITH the enrollment of several new gliding students in their course, the Wings Corporation now instructs fifty-three prospective pilots of motorless aircraft.

The Wings Corporation's new field, Wings Port, located near Ambler, is one of the newest airports to be developed in the Philadelphia area.

NON-STOP airplane service between New York and Washington was recently inaugurated by the Ludington Line. Two planes are flown each way daily.

JOSEPH A, SIMCOCK of the F. & S. Flying Service was recently made factory representative for Aeronca airplanes in the East. The F. & S. Flying Service has been appointed distributors for Aeronca planes in Philadelphia and vicinity.

THE Kellett Aircraft Corporation recently announced the appointment of four new distributors for the sale of the Kellett Autogiro. George M. Pynchon, Jr., New York, will concentrate on the Westchester County territory. L. B. Cooper of Woodmere, L. I., will have headquarters in the Long Island area. Cincinnati, Ohio, territory will be covered by Allen Hale, operat-

#### AIR BRANCH OF NEW YORK STATE POLICE

В. Котн

THE skyways of New York State are now being patrolled by the New York State troopers, following the purchase of a de-luxe three-place Fleet biplane as the first step in the organization of an aeronautics branch in the division of State Police. Lieutenant Tremaine M. Hughes, transport pilot and head of Troop D, Oneida Barracks, is chief of the new air division.

Several novel features are incorporated in the construction of the ship, including a metal shield to cover the front cockpit; the windshield is made detachable by the use of cotter pin studs similar to cowling studs. so that the shield may be slipped off in a few minutes. The cover then completely closes the front cockpit, turning the machine into a pursuit type job and adding to the performance of the plane. The ship is powered with a 125-horsepower Kinner engine and is equipped with an air starter and steel propeller. Semi-Airwheels and tail wheel are included in the equipment, in addition to a luggage compartment directly behind the rear cockpit. The ship is built for radio installation.

Shortly after the trooper ship was purchased. Commissioner Henry M. Morgenthau, Jr., of the State Conservation Department, announced the purchase of a similar ship for use in his department for detecting forest fires. This plane will be used to cover the Catskill and Adirondack mountain areas on patrol work.

During the State Legislature session of 1930 the aviation commission, headed by Senator J. Griswold Webb, adopted many of the Department of Commerce regulations governing aircraft. Recently the State law prohibiting flight by unlicensed planes and pilots became effective. Lieutenant Hughes has started an inspection tour of the various airports in New York State in connection with his new duties. He is compiling an index system which, when completed, will contain the names of all pilots and plane owners in New York State, together with the license number of every ship owned and operated in the state.

When the purchase of the ship was announced it was said that several more planes would be added to the branch as the need arose. It is expected that a transport ship will be added to the service in 1932 for the transportation of troopers to scenes of action in case of emergency.



Fleet of Kellett Model K-2 Autogiros produced by Kellett Aircraft Corporation, Philadelphia, Pa.

ing from Lunken Airport. Samuel Metzger, formerly of the Metro Aircraft Company, will hold the Kellett distributorship in the northern section of California, with headquarters at the San Francisco Bay Airdrome.

AN Aeronca was recently added to the equipment at Sky Haven Airport, near Goshenville, Pa,

PLANS for an airport at Bloomsburg, Pa., were recently announced by Harry L. Magee, Charles C. Housenick, and Milton K. York. They have purchased a seventy-acre tract along the Susquehanna River and made preparations for grading the field. The erection of a large hangar is planned. Operation of the field is expected to begin next spring.

CONTRACT for construction of the new Guggenheim Airship Research Institute at Municipal Airport, Akron, Ohio, has been awarded to the Indiana Engineering & Construction Company by trustees of the University of Akron on a bid of \$46,350. Under terms of an agreement with administrators of the Guggenheim Foundation, Akron City Council voted \$100,000 in bonds for the building. Another \$50,000 is available from the Guggenheim fund. Work on the building was recently started.

A TEN-ACRE river bottom field at Letart Falls is being developed into an airport at Pomeroy, Ohio. The field, on the main highway, is in line with the Pittsburgh and Huntington flying routes.

CENTURY AIR LINES has announced regular excursion flights. Excursion rates are offered each week-end for flights between Cleveland, Toledo, Chicago, South Bend and Detroit.

ON A BID of \$4,999.50, the Stinson-Detroit Aircraft Corporation of Wayne, Mich, has been awarded the contract to supply an airplane for the State of Ohio. The plane will be used by the office of the Adit. General and the State Director of Aeronautics. The ship will accommodate three passengers and pilot.

PORT ASHLAND, Ashland, Ohio, was dedicated recently. More than 10,000 spectators attended the dedication. Fourteen ships participated.

THE city of Columbus, Ohio, has proposed to lease its hangar at Port Columbus to the Federal Government under the following terms:

The lease is to be five years with a year-to-year renewal option favored by both parties; rental \$1 a year; city maintains right to reclaim half of hangar for commer-

cial use whenever it desires it, provided a thirty-day notice is given; Government to maintain building and be given free use of the field. If the lease receives Government approval it goes into effect November 1.

A GROUP life insurance policy totaling \$2,345,000 was recently issued on 1,003 employees of Thompson Products, Inc., Cleveland, O., manufacturers of aircraft and automobile valves. The policy, acquired through the Prudential Insurance Company of America, grants insurance to each worker according to rank and sex, the amounts ranging from \$1,000 to \$10,000. The premium payments are to be shared by the employees and Thompson Products, Inc., the policy being of the contributory type.

RICHARD C. MARSHALL of Cleveland, Ohio, has been elected president of Thompson Aeronautical Corporation operating Transamerican Airlines Corporation, after four years as vice president and general manager of that organization. He succeeds Edwin G. Thompson, also of Cleveland, who became chairman of the board of directors after resigning as president because of the pressure of business connections with Thompson Products, Inc. Robert Grant, Jr., of New York City, was elected to the directorate.

#### Baltimore Aircraft Show

AIR CIRCUSES, indoor aircraft exhibitions, aircraft displays, glider demonstrations and model aircraft contests feature the preliminary program of events announced recently for the Second Annual Baltimore Aircraft Show and Industrial Exposition, Baltimore, Md.

The combined indoor and outdoor aviation exhibition will be held November 15 to November 22, inclusive, at the Service Field Airport, Park Heights Avenue above Old Court Road, Baltimore.

Lieut. Edward R. Fenimore, manager of Service Field, has been appointed director of flying activities. Ray Krimm, manager of the first Baltimore Aircraft Show, will direct the indoor exposition.

A 100-foot-by-150-foot tent will be added to the hangar facilities at Service Field to accommodate twenty-five airplanes and a number of aviation and industrial booths which will comprise the indoor section of the show. The main hangar and the exhibition tent will be decorated and specially wired for the show.

#### SELLING USED PLANES IN THE EAST

By A. B. Skoien and Richard O'Connor Aviation Clearing Co., N. Y.

S EVERAL years' experience in selling aircraft convinced those responsible for the formation of Aviation Clearing Company that general brokerage offered a lucrative field in the East.

Taking advantage of the abundant supply of used ships in this section, business was started with the object of selling these airplanes at owners' prices. This radical departure from the general practice in the East has proved justifiable and results have been gratifying.

The majority of the used airplanes in the East are listed by one or two brokers. The Aviation Clearing Company enjoys the position of being the first active general airplane brokers in the metropolitan area. Already plans are in the making for representation in other states. Inquiries and sales have justified such a move.

While many commercial airport and air-

plane dealers are dabbling in used equipment, the concentration is usually in schools, service or new planes. Our method of marketing used airplanes differs very little from that of other brokers. Periodically cards are sent to our list of prospects. This list increases continually due to our advertising. From time to time telegrams notify our special inquiry or waiting list that their ship is available.

In presenting used airplanes to buyers, every effort is made to secure the life history of the ship in question. In some cases this involves much work.

In no case do we add our brokerage. No matter what concession the seller makes the buyer, our brokerage is figured in the owner's price. This policy justifies our being in business and speaks for the success which we have attained.

In addition to used airplanes we have succeeded in inviting inquiries for new equip-

THE General Aviation Manufacturing Corporation will move its headquarters from New York to Baltimore, Md., and the municipal airport will become the center of the company's activities, according to a recent announcement of Mayor Howard W. Jackson of Baltimore. It was reported by the Mayor that the factory will employ from 600 to 1,000 workmen and the company will take over the idle plant of the Curtiss-Caproni Corporation, located on the municipal airport.

#### SOUTHEAST

A NUMBER of courses in aviation, including both ground and flying, have been amounced recently by various organizations in Florida. The McMullen Aviation School recently opened its fall ground course term at the municipal airport, Tampa, Fla., to continue for a period of twenty-four weeks. The McMullen organization recently inaugurated a ground and flying school at Haines City and Plant City, Fla.

Leland Hyzer recently reported the establishment of a new American Academy of Air Law at Miami, Fla.

John T. Holdsworth, instructor at the University of Miami, has announced a non-technical introductory aviation course conducted by the college.

A. H. Root, of the Dade County Agricultural High School, Miami, Fla., has formed an aeronautic club to study Air Commerce regulations, theory of aerodynamics, airplane engines and aerial navigation. Tuition will be free.

Frank Say has opened a new ground school in engine and airplane study at the municipal airport, Tampa, Fla. Eight students have enrolled.

INVESTIGATION of areas included in the route of the proposed Gulf Coast Airways, linking New Orleans, Pensacola, Tampa and Havana, has been started under the joint direction of Jerome A. Waterman, representing the Tampa Chamber of Commerce, and R. G. Patterson of Pensacola, Fla. A fund of \$5,000 has been raised to finance a survey of the coast to locate combination land and seaplane bases. Officials of the line expect to begin operations with a fleet of at least four amphibions.

THE state road department of Florida has begun a preliminary survey of suitable sites for emergency airports to be built by the state with funds derived from the tax on gasoline used by airplanes.

THE McMullen Aircraft Corporation of Tampa, Fla., has leased the airport at Gainesville, Fla., for three years. The company will operate the field for regular commercial flying and will conduct a flying school. The field has a runway 500 feet by 2,000 feet.

I. G. HEDRICK, manager of the municipal airport, Tampa, Fla., reported recently that there were no accidents at the field during the year ending September 30. During this period there were 405 visiting airplanes, 1,460 arrivals and departures of regular mail and passenger planes. Thiteen planes have been engaged in regular student training and commercial flying.

DAYTONA Beach Flying Service is completing a large hangar at the Daytona Beach, Fla, Municipal Airport. The company is equipped for aerial taxi service and flight instruction, with L. A. "Larry" Schmarje in charge.

A PATENT on a new airplane rudder control has been granted to Edwin Walden of Tampa, Fla. The invention locates the entire controlling apparatus within the fuselage, and eliminates external cables and hinges. The usual gap of a half inch or more between rudder and fuselage is eliminated, as well as the parasitic resistance caused by exposed parts. An improvement in the appearance of the plane's tail assembly is also claimed, as well as improvement in the aerodynamic efficiency. Walden's rudder control consists of a sprocket wheel, a compound and a single spur gear, all attached to a half tube rudder post. On the end of the roller chain carried by the sprocket wheel are steel cables which extend to the rudder pedals in cockpit or cabin.

#### NORTH CENTRAL

ORGANIZATION of the Chieftain Flying Service, Council Bluffs, Iowa, headed
by Harold Nymann, was announced recently. Incorporated at \$10,000, the company
will operate an aviation school and taxi
service with a Travel Air three-place ship
and a five-passenger Ryan cabin monoplane
as equipment. Two steel hangars are being
erected at the Council Bluffs municipal
field.

CONTRACT for a cindered runway, 2,-600 feet long by 200 feet wide, at the municipal airport, Council Bluffs, Iowa, has been let by the city council. The project will cost approximately \$2,600. Work was to be completed November 1.

UNDER supervision of John A. Casey, manager of the municipal airport, Chicago, Ill., a new northwest-southeast runway is under construction; when completed it will be 3,400 feet long, making four complete runways of over 2,500 feet each. The new extension will cost approximately \$30,000.

EXECUTIVE and traffic offices of the Braniff Airlines have been moved from Chicago and Kansas City to Oklahoma City, Okla., according to Paul Braniff, president of the line.

K. S. DALY has been selected to head the Curtiss-Wright flying base at Curtiss-Reynolds Airport, north of Chicago, Ill.

EDGEWATER FLYING CLUB, now three years old, recently opened 1931 fall classes under the supervision of George K. Spanier.

THE E. M. LAIRD AIRPLANE COM-PANY has moved to larger quarters and is now located at 5321 West 66th Street, Chicago, Ill., near the municipal airport. "Mattie" Laird for ten years has been building to-order ships in a factory at Ashburn Field. The company is going into production on a Laird cabin job, it is reported.

THE downtown ticket office of United Air Lines in Chicago has been refurnished and redecorated, including the installation of a modernistic counter, in which complete stocks of tickets and advertising matter are stored. The new installation facilitates handling of reservations and ticket sales.

IMPORTANT CHANGES in passenger, mail and express schedules of Transamerican Airlines offer improved service to five Michigan cities and all other up-state Michigan and Indiana cities on AM 27 indirectly.

Detroit and Chicago are linked for the first time by fast night mail and passenger service starting at Pontiac and operating via Detroit, Ann Arbor, Jackson, Battle Creek and Kalamazoo daily except Sundays and holidays.

Passenger accommodations on the company's westbound mail and passenger planes flying between the up-state Michigan cities of Bay City, Saginaw, Flint, Lansing, Muskegon, Grand Rapids, and Chicago are considerably improved. A multimotored airliner leaving Detroit daily at 5:30 p. m., Eastern time, now connects at Kalamazoo with the mail and passenger planes from up-state Michigan cities.

On November 9, Transamerican Airlines will inaugurate eighty-minute mail, passenger and express service between Detroit and Cleveland via Toledo. This schedule will replace temporarily the fifty-five minute amphibion service between Detroit and Cleveland, suspended yearly in November.

TRANSAMERIAN AIRLINES COR-PORATION has completed plans for a new \$75,000 air transport base on the Chicago, Ill., Municipal Airport, started construction, and will begin utilizing it as the western terminus for its Great Lakes U. S. Air Mail, Passenger and Express system about November 15. It is located near the City of Chicago's new \$150,000 airport administration building.

This improvement marks the westward expansion of the aeronautical sales and service chain of the holding company, Thompson Aeronautical Corporation. The latter already operates major airplane and engine overhaul and service bases in seven Mid-Western cities, including Cleveland and Detroit.

The new structure will be built of brick and steel, 100 feet by 155 feet, with space for offices, stock rooms, service shops and a boiler room, thirteen feet by forty-two feet.

SURVEYS made by officials of Century Air Lines show that so many of their passengers are youngsters, accompanying their parents, that the company has decided to ofter additional inducement for family rides by offering a new schedule of half fares for children from three to twelve years of age. Youngsters up to three years will be carried free. The new fares went into effect October 18.

It is estimated by company officials that of the 40,213 passengers carried by Century in the last six months between Chicago, Detroit, Cleveland, Toledo and St. Louis, fully eleven per cent were twelve years or younger.

AIR MAIL and passenger service over Lake Erie to Detroit will be continued throughout the winter, it was recently announced by Don B. Wilson, divisional traffic manager of Transamerican Airlines Corporation. Heretofore the service has been suspended during the cold months.

THE Aeronautical Commissions of five states have selected Stinson Junior planes for use by the commissions' inspectors, according to an announcement made recently by W. A. Mara, vice president of the Stinson company. The states are Michigan, Illinois, Arkansas, Pennsylvania, and Ohio.

With the recent purchase of two additional Stinson Juniors powered with Lycoming engines, the U. S. Department of Commerce brought its total of Stinson Junior planes to ten. These planes are used by representatives of the Department in their work of inspecting airports throughout the country.

MAJOR LESLIE G. MULZER of Wisconsin Rapids, Wis., owner and operator of the Tri-City Airport, recently reported the purchase of the total assets of the Comet Engine Company at Madison, Wis. All special tools and parts for Comet engines which were formerly manufactured at Madison have been transferred to the Nepco Tri-City Airport, where a complete factory service division is being set up to take care of all Comet engines now in service.

The Nepco Tri-City Airport is the largest airport in the state of Wisconsin and is an authorized Wright and American Cirrus service station. New engines will be assembled from parts already manufactured and if necessary additional parts can be manufactured in the shops of the Nepco Tri-City Airport.

TRUE ECONOMY
IS
A REAL BUY
AT
A BIG SAVING

TWO TELEGRAPH typewriters have been installed at the Milwaukee, Wis, County Airport for the transmission and receipt of weather reports. A radio directional beacon is to be installed at the port, according to I. V. Marshall, district supervisor.

A GOVERNMENT airport in the vicinity of Gotham and about twelve miles south-east of Richland Center, Wis., will result from the recent lease for that purpose of parts of several farms in that territory.

THE HARTLEY-PFAENDER AVIATION COMPANY has been incorporated to operate student instruction, aerial photography, air taxi service and airplane sales and passenger hopping with the base of operations at Williamson-Johnson Municipal Airport, Duluth, Minn. Guilford Hartley has been elected president and treasurer; A. J. Pfaender, vice president and chief pilot, and W. B. Fryberger, secretary. The company is a dealer for Alexander Flyabouts, B. G. spark plugs and other accessories.

THE Third Nebraska Air Tour was scheduled to start at Burwell, Neb, October 21. A total of ten cities in Nebraska was included on the route of the tour, scheduled to end October 30 at Beatrice, Neb. The program at each stop included formation flights, stunt flying, speed races, bomb dropping and dead stick landing contests, a parachute jump and autogiro demonstrations. J. Porter Allen, secretary, estimated that more than forty planes would participate.

#### SOUTH CENTRAL

PLANS FOR THE administration building for Lambert-St. Louis Field are nearing completion, and it is hoped to have the building ready next spring. The structure is the last of major importance planned for the municipal airport; the \$2,000,000 airport bond issue is practically expended and the airport commission has expressed the intention of retaining approximately \$100,000 in the treasury for future needs of the field.

FOR instance, an article worth \$8.40—when purchased for only \$5.00, at a saving of \$3.40—is a real buy. That is true economy. That is what we offer you on a two-year subscription to AERO DIGEST. The single copy price is \$.35, or \$8.40 for two years. Subscribe for the same period at \$5.00 and you save the difference of \$3.40. Use the convenient coupon over here on your right.

C. LAMBERT, wealthy aviation enthusiast, recently accepted delivery of a Curtiss "Speedwing Sportsman" biplane from the Curtiss-Wright Airplane Company.

The ship, built to Mr. Lambert's specifications, cost approximately \$14,000. Topspeed is reported to be 190 miles per hour. The powerplant is a special Wright engine developing more than 500 horsepower. There are two single cockpits which may be enclosed with hatches, each fitted with a combination heater and ventilator.

CONSTRUCTION of the national operating headquarters of Transcontinental and Western Air at the Kansas City Municipal Airport is advancing rapidly, with completion of the work scheduled for the end of October. The company's original plan, to make additions to the old Goebel Flying School buildings, has been abandoned and an entirely new structure is being built, to be 170 feet wide and 300 feet long. There will be an office structure to house the general operating headquarters of the company, and large hangar space. When completed the cost will be about \$250,000. T. and W. A. will pay the city an annual rental of five per cent of the total cost of construc-

AMERICAN AIRWAYS will shortly construct an intermediate landing field at Delta, Mo., for use on their Chicago-St. Louis-Memphis line. The field when completed will have two runways 2,500 feet long and 500 feet wide.

THE REARWIN AIRPLANE COM-PANY of Fairfax Airport, Kansas City, has opened a flying school to be known as the Ken-Royce Flying Service. H. C. Clyborne, formerly of the Porterfield Flying School, is director. Ground school training is given in the Rearwin factory.

A TOTAL of 261 Curtiss-Wright "Juniors" was manufactured and delivered during the first eight months of this year by the Curtiss-Wright Airplane Company, Robertson, Mo., according to a statement recently issued by the company. This announcement supplements a previous report published in the October issue of Arao Drossr to the effect that more than 175 of these ships were sold during this period.

| 1  | AERO DIGEST, 220 W. 42d St., N.Y.C                                                                                                                                                                     |
|----|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ٦  | I'm not "Scotch," but I do know 'bargain when I see one. Put my name on your two-year subscription list and start my subscription with the December issue. Enclosed is my chec money order for \$5.00. |
| Ŀ  | Name                                                                                                                                                                                                   |
| -S | Address                                                                                                                                                                                                |
| S  | City                                                                                                                                                                                                   |
| ᄪ  | State                                                                                                                                                                                                  |
|    | Occupation                                                                                                                                                                                             |

Of the total of 261, more than seventy-five per cent passed from the hands of Curtiss-Wright dealers to private owners.

STATE as well as Federal rules and regulations govern fliers and aircraft in Oklahoma on and after October 15.

The state highway commission adopted a set of six rules recommended to it by a state-wide committee and E. McDonald, state aircraft director.

Under provisions of a law passed by the last legislature, the enforcement of aircraft statutes is placed in the hands of the commission.

The state rules follow closely those of the United States Department of Commerce. All pilots and airplanes must be licensed by the commission. Those having Federal licenses will be given state permits without additional examination.

Peace officers, highway department enforcement officers, and a large number of commissioned pilots and airport managers were directed to enforce the law.

A CONTRACT for an aerial survey of approximately 1,500 square miles of the Alluvial Valley of the Mississippi River between Baton Rouge, La., and the Missispipi-Louisiana state line has been awarded to Southwestern Aerial Surveys, Inc., Austin, Texas, by the U. S. Engineer Office, Second New Orleans District, New Orleans, the company recently announced-

The Southwestern Aerial Surveys, Inc., last spring completed an aerial survey of approximately 15,000 square miles of the project for the U. S. Engineer Office, Vicksburg, Mississippi, and recently completed approximately 650 square miles of the project for the U. S. Engineer Office, Memphis, Tenn.

AMERICAN AIRWAYS has leased the Robert Mueller Municipal Airport, Austin, Texas, for twenty years, paying the city \$7,000.

CONTRACT for the construction of runways, a taxi strip and ramp at Love Field, Dallas, Texas, has been let to R. J. Estep Company. The city council has opened bids on drainage work at the port, and is furthering the purchase of ninety acres of land at an estimated cost of \$125,000.

#### SOUTHWEST

FORMATION of Stearman-Varney, Inc., an airplane manufacturing concern with Lloyd Stearman as president and Walter Varney as chairman of the board of directors, was announced recently. Robert Gross of the Viking company is vice president of the new company. Franklin Rose, president of Varney Air Service, Ltd., is secretary.

Shop and office space has been leased in the main hangar at the San Francisco Bay Airdrome, Alameda, Calif., where Viking flying boats and a new three-place opencockpit sport plane designed by Stearman

will be manufactured.

American rights to the manufacture of the Viking boat have been turned over to the new corporation.

The new Stearman plane, to be powered with a Wasp Jr. engine, will have a high speed of 178 miles per hour, a cruising speed of 135 miles per hour and will carry 690 pounds payload. The ship will have an all the properties of the ship will have an all the ship will have a ship will be ship

A TOTAL of 6,013 passengers was carried by planes operating from San Francisco Bay Airdrome during September.

WITH an enrollment of fifty-six students in the master mechanic class and fourteen students in the flying course, the Boeing School of Aeronautics, Oakland Municipal Airport, Calif., opened its fall quarter courses on October 5. Master mechanic students will have 1,444 hours of lecture and laboratory instruction in a course of nine months' duration.

HANS KIRCHNER, formerly operations manager of the Fillmore Flying Service at Oakland, Calif., Municipal Airport, has opened a flying school at Berkeley Municipal Airport.

AIRPORT FACILITIES are now available at Benbow Resort, in the Mendocino forest of Northern California. The main runway is 2,200 feet long and 500 feet wide. A cross runway is planned. Field accommodations include hangar space for six planes and fueling service.

HEADED BY Fred Lencioni, a flying school has been established at Santa Rosa, Calif., Municipal Airport.

BOUNDARY and flood lights have been installed at Bidwell Field, Red Bluff, Calif., making the field available for night landings. Previous to this improvement, two runways, one 2,800 feet long and the other 2,000 feet, were constructed.

SAN JOSE FLYING SERVICE has been organized to conduct the commercial aviation business formerly operated at San Jose Airport by Hudson Mead and Newton Orr. Mead is manager of the new company. Orr has withdrawn to engage in other business.

DENVER'S importance as an aviation center has increased rapidly in 1931, according to figures released this month by the Western Air Express. Paid passenger traffic in and out of Denver by air the first eight months of 1931 showed an increase of 104 per cent over the same period of 1930.

A SPECIAL course in aviation ground school will be conducted this year in the night school classes of the Ogden, Utah, High School, with E. J. Rosengreen and W. G. Collette as instructors. The Weber County High School conducted a similar course during the summer.

ALL PREVIOUS speed records or Western Air Express between Los Angeles, Calif., and Salt Lake City, Utah, were broken recently by W. L. Shaffer, pilot, and H. B. Sneed, co-pilot, in three hours and forty minutes. This is twenty-five minutes better than the previous record despite a fifteen-minute stop at Las Vegas, Nevada.

#### CONTACTS

By F. E. SAMUELS

THE PROGRESS made in reestablishing activities at the Dycer Airport, formerport, illustrates that the aviation industry, with conservative business management, with a constructive point in view, offers many opportunities today.

Many improvements have been made in the flying field proper. The runways have been leveled, the take-off runways graded and oiled, a strip the full width of the airport on the boulevard side graded, oiled and rolled and a large public address system has been installed.

Several manufacturers' representatives have offices in the up-to-date administration building which is the headquarters of the flying school as well. Student enrollments have been more than satisfactory. Bragunier has been appointed chief instructor. The Dycer brothers report that the flying receipts doubled in August over July and trebled in September. The individual hangars are all occupied and storage space in the large hangars is practically taken up. Negotiations are under way involving the establishment of the airport as a base of a major airline. Every Sunday finds the airport lined with cars. The Dycer brothers were formerly located at their own airport on Western Avenue, where they were well and favorably known to those in the industry on the Coast.

#### NORTHWEST

CONSTRUCTION of the municipal aviation depot, Spokane, Wash, will start immediately, according to a recent announcement of F. E. Martin, contractor for the new building. Work will require three months for completion. Mr. Martin was awarded the construction of the depot on a bid of \$22,856.

# A VALUABLE AND HANDY

little coupon over there on the opposite page. Use it —for it will save you some perfectly good money.



WHAT IS YOUR INVENTION? Send me a simple sketch or model for CONFIDENTIAL ADVICE-

DEDICATION CEREMONIES were recently held at the Cusick, Wash., airport.

THE AUTOGIRO of the Puget Sound Airways of Seattle, Wash., was on exhibition recently at Tacoma Field, the Pierce County airport, Tacoma, Wash. Admission was charged to see the plane and rides were offered the public.

IN THE SIX MONTHS ending October 1, Mamer Air Transport, Portland, Ore... carried 3.030 passengers on the Spokane-Wenatchee-Seattle-Tacoma line, according to the semi-annual report recently issued by the company. Planes traveled 99,970 miles, the passenger miles flown numbered 951,488, and the average number of passengers per flight was ten. The planes used were the twelve-passenger Ford type.

Under contract with the United States Government, the Mamer company flew over a great part of eastern Washington, northern and central Idaho and western Montana in the last season of forest fires.

More than 100 chartered flights were made to many parts of the United States, Canada and Mexico. The number of students taught to fly since the company inaugurated its school exceeds 1,000.

PENDLETON AIRWAYS, INC., has inaugurated air passenger service between Pendleton and Portland, Ore., operating on a schedule of one round trip each day. A one-way flight between the cities is made in two hours as compared with nine hours by train or bus. Claude Rigdon is president of the company.

#### TRADE LITERATURE

NEW PAMPHLETS AND BOOKS OF INTEREST TO THE AERONAUTICAL INDUSTRY

#### Fansteel Contact Points

A BOOKLET, "Metallurgy and Design of Contact Points," was recently published by the Fansteel Products Company, Inc., Chicago, Ill. The importance and function of contact points in internal combustion engines and numerous electrical devices are discussed. It is asserted that of all metals tungsten comes the closest to filling the requirements for contact points and that molybdenum is a close second. The properties and uses of these two metals for this purpose are discussed. Tables of dimensions of standard types of contact points are included.

#### G. E. Electric Furnaces

ELECTRIC heat as a solution to difficult production problems by manufacturers is discussed in detail in "Electric Furnaces," a booklet recently published by the General

#### NEW AERONAUTICAL BOOKS

IJР

By "JACK" STEARNS GRAY

GEORGE A. GRAY is the first licensed flier from the State of Maine. In October, 1912, he made an eighty-nine-mile flight from Malone to Lake Saranac, N. Y., flying a thirty-five-horsepower ship, landing on a cow pasture in the Adirondacks. His feat was hailed as an important pioneering flight and acclaimed as an aviation epic. The next day, a young girl approached Gray and offered him \$50 for a flight over the mountains. She explained that she was from Virginia and wished to be the first woman from that state to soar aloft. He consented and flew her a distance of eight miles over the mountain regions. The girl was "Jack' Stearns, becoming soon after the Adirondack flight, Mrs. "Jack" Stearns Gray

After their marriage they barnstormed the country. "Up" tells the story of those first years, the humiliation of jeering crowds, the appreciation of cheering throngs, all in the day's work to aerial pioneers. Primarily, this book is a comparison of yesterday and today in flying.

#### NATIONAL REGULATION OF AERONAUTICS

By Charles C. Rohfing, Ph.D.

T HIS book is written on the premise that in the five years in which the Department of Commerce has regulated civil aviation, sufficient time has elapsed to demonstrate some of the defects and some of the advantages of the regulative system. The author has undertaken a study of this system, most of which deals with the administration of the Air Commerce Act. One chapter has been reserved for a discussion of the legal problems of aviation. The author believes that the entire law of aviation is in the pioneer stages and that the groundwork is being laid for the future. Although most studies of administration contain a final chapter on conclusions and recommendations, the author has refrained from criticism unless he did not believe he could suggest improvements. Apparent defects he accredits in many instances to inadequate appropriations by Congress rather than the work of the Aeronautics Branch.

The contents include the following: Federal Assistance to Aviation and Attempts at Regulation Previous to 1926; The Air Commerce Act of 1926: The Regulation of Air Commerce

#### PRINCIPLES OF FLIGHT

By Edward A. Stalker

I NTENDED primarily for the engineering student and for the practicing engineer desiring to review modern theoretical developments, this book discusses the elements of the theory of flight, assembled from various sources into a single volume. The physical and engineering aspects of all topics are stressed. The material does not proceed bevond a first course in calculus of which the reader is presumed to have a knowledge. "Principles of Flight" is intended to provide aeronautical engineers, aircraft designers, aeronautic instructors and students with a broad working knowledge otherwise not available in one convenient volume.

#### A HISTORY OF AIRCRAFT By F. ALEXANDER MAGOUN and

ERIC HODGINS

I N this book the authors have endeavored to present a world history of aircraft as up to date as possible. All aircraft are divided into six classifications for the purposes of this work: free balloons, navigable airships, ornithopters, helicopters, gliders and power-driven heavier-than-air craft. In each section the development is traced in a detailed and chronological order. The authors have attempted to describe all attempts to navigate the air from the early legends down to the present time, including the Post and Gatty flight.

Electric Company, Schenectady, N. Y. Various G. E. products designed for electric heating are described and illustrated by means of charts, diagrams and photographs.

#### Multi-Speed Drive

AN illustrated leaflet devoted to the Westinghouse-Wise Multi-Speed Drive has been published by the Westinghouse Electric & Manufacturing Company. The drive consists of an adjustable speed reducer built into a standard induction motor. Instant speed changes can be made with the motor running under load.

#### Curtiss and Wright Engines

SPECIFICATIONS and photographs of all the standard models of Curtiss and Wright aircraft engines are contained in a booklet recently announced by the Wright Aeronautical Corporation, Paterson, N. J. The booklet is of the loose-leaf type to per-

mit the insertion of revision sheets as the specifications are revised, in order that the contents may be kept up to date.

#### Paasche Airbrushes

A CATALOG on the complete line of automotive airpainting, airfinishing and airoiling equipment produced by the Paasche Airbrush Company, Chicago, Ill., was recently issued.

#### New York Air Laws

THE New York State Commission on Aviation recently published a booklet, "Laws Affecting Aviation of the State of New York." The acts pertaining to aviation, which have been put upon the statute books of New York State, are given in full detail. The aviation policy of the state is predicated on the belief that the basic control and regulation of aviation is primarily the function of the Federal Government, aided by states,



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- Inglewood, Cal., and at the Oakland
- Municipal Airport, Oakland, Cal.

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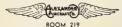
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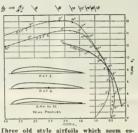
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# THE BOEVING DEVICES

POLLOWING our last month's description of a simple aerodynamic balance it would seem quite fitting to advance to a story of more elaborate devices designed for measuring aerodynamic forces. In view of this we have for our present study a complete amateur model wind tunnel and marine model basin, built portable so that it can be set up in the classroom, lecture hall or laboratory.

For the information relative to this ingenious collection of devices we give acknowledgment to Mr. Detmar Fr. Stahlknecht of 241 McKee Place, Pittsburgh, Pa. In collaboration with his classmate, Mr. Boeving, the apparatus was designed and built while these men pursued their studies in aerodynamics. It thus enabled them to test to their own satisfaction the various streamline shapes and airfoils which were the object of classroom study. The devices have been so successful that it has been proposed to manufacture them in complete sets for classroom use, under the trade name of "The Boeving System." However, individual experimenters will find it quite possible to build their own units provided they have the necessary skill, patience, and tools. In explaining why the construction of R. E. DOWD

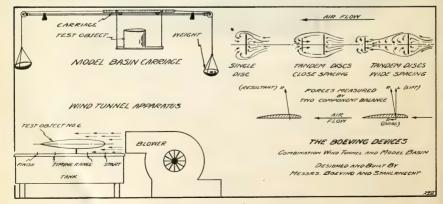


Three old style airfoils which seem especially suited for models

the device was undertaken, Mr. Stahlknecht points out that in the study of almost any of our sciences, demonstrations and actual physical tests are considered quite indispensable. He and Mr. Boeving could see no reason why a course in aerodynamics should not be similarly treated and consequently proceeded with its design and construction.

#### The Measurement of Drag

In devices of the kind under consideration the outstanding problem is to secure quantitative results. With extremely low air velocities and small models the actual forces to be measured are necessarily small. This condition requires a high degree of precision in the measuring of the forces in order to avoid errors. Such precision calls for uniformity of air velocity and a system of measuring free from frictional variations due to the magnitude of the forces being measured. In this latter requirement we doubtless have our greatest problem in amateur devices. In the Boeving design it is tackled from an entirely new angle. Instead of trying to measure the small forces, working on a fixed model through a system of levers, the test object is mounted on a floating base placed in a water tank. It is not restrained from movement but is allowed to yield to the air blast. Objects of a high resistance move quickly against the water resistance, while objects of a low resistance move slowly. The distance of travel is fixed for all tests so the time required to move from one point to the other, after



the start has been made, is the factor indicating the coefficient of drag of the test object. One might immediately object to this arrangement on the ground that the intensity of the air blast varies more or less indirectly with the distance from the mouth of the tunnel. This is true but the same variation exists for any object under test since they travel the same distance. Finally, of course, in order to obtain a coefficient it is necessary to work back to the standard flat plate disc having a known coefficient, so we have again a system based on comparison of results.

After all it should not be misunderstood that a test system, using direct comparisons as its basic principle of operation, is any less effective. Our standards of measurement are no more than values arbitrarily established for the purpose of facilitating research, trade, and general exchange. It is in the final analysis quite as valuable to know that a certain streamline shape has a resistance of one-seventeenth as much as a disc of the same area, as it is to know that the disc resistance is, for example, seventeen ounces, and the streamline shape, one ounce.

#### The Measurement of Lift and Drag

While comparison of results directly characterizes the principle used, in tests of drag we have an entirely different device used for measuring lift and drag simultaneously. This is called a two component balance, so named because it measures vertical and horizontal components separately. (See diagram and cut.)

#### The Model Basin

The Boeving system has further utility through the use of the water tank as a model basin for testing marine objects. In the accompanying drawing we have pictured a carriage for drawing objects through the water in the tank. Propul-



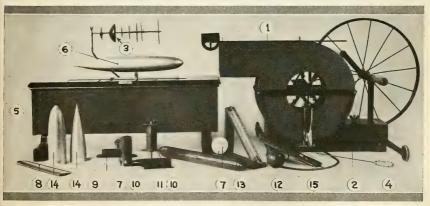
The two component balance which measures lift and drag simultaneously

sion is furnished by falling weights, which are capable of doing a definite amount of work. This sort of test has its application in the study of pontoons or flying boat hulls. The time and distance traveled give the investigator his data for classifying the object under test.

Thus we have in the Boeving device three distinct units: the drag tester; the two component balance; and the model basin. We do not propose to describe in great detail each unit. The drawing covers the salient points of the model basin and the wind tunnel drag tester, while the cut shows the construction of the two component balance. It is of greater interest to investigate how each unit is used and how it is possible to demonstrate certain aerodynamic laws and principles. If we first consider the drag or resistance tester as shown in the drawing, we can at once demonstrate several interesting things.

#### Resistance or Drag Tests

Perhaps our starting point should be a test on a flat disc of a certain diameter. We bring our air speed up to a standard velocity by hand power through the crank or by an electric motor drive. Our air speed indicator at the mouth of the blower gives us our velocity, which is maintained uniformly. Our disc is mounted on a post which projects up from the float through a slot in the top of the tank. The float has been ballasted with suitable weights so that it is immersed in the water the same amount as when heavier models are used. When everything is running smoothly the post is freed and the air blast drives the disc down the tank. The inertia of the moving mass prevents an immediate start but it soon adopts what appears to be a uniform speed. This occurs before the pointer on the post passes the first timing mark. A stop watch clicks into action



The Boeving combination wind tunnel and model basin

mark. A stop watch clicks into action as this point is reached and clicks again to a stop when the second point is passed. Here we have the time consumed in driving our disc a certain distance against a certain resistance. Let us assume that the average time recorded in several tests is 1.7 seconds.

If we now substitute the streamline model as indicated, taking care to balast so that the total weight of the whole moving system, comprising float, post and model, is exactly the same as previously, we are ready to run our next series of tests. Our average time is now 7 seconds for the streamline model of the same diameter as the disc. If we now wish to compare the resistances, we have Disc. 7º 49 17

Streamline 
$$1.7^{\circ}$$
 or  $-$  or about  $-$ .

In other words, according to Mr. Stahlknecht's results, the resistance of the disc would be seventeen times as great as for a streamline of the same diameter. Now, if we take the drag coefficient for a flat disc as .00123 according to Eiffel (see October Experimental) we can approximate the value for K for the stream-

line body as 
$$\frac{.00123}{17}$$
 = .000073. This last

value would seem quite high in view of tests run in standard wind tunnels, but perhaps this is just the result of the lower air velocity used in our tests. Mr. Stahlknecht assures us that careful tests of the apparatus indicate that its results are accurate to within 5%.

While these tests are in progress it is possible to visualize the air flow around the test object by allowing silk threads, mounted on thin sticks, to trail in the air stream. It will be noticed that there is great turbulence around the disc, particularly to the rear, while around the streamline body the flow is smooth and regular. Such a demonstration is of great value to a class in aerodynamics.

A less obvious condition is discovered in connection with multiple discs, as shown by numeral 3. If a large disc is anchored to the rod and a smaller one slidably mounted on the rod behind the large disc, which shelters it from the air blast, we can observe some interesting results. With the air blast blowing on the large disc we can push the smaller one in the direction of the air flow, but on releasing it, it will fly back against the large disc. This is caused by the region of low pressure back of the large disc. If we move the smaller disc still farther away we soon find a place where it no longer returns, but is blown away from the large disc. This point is where the normal pressure is restored. A bicycle rider pacing an automobile soon learns from practical experience where these points lie. It scarcely need be pointed out that the high resistance of the disc is due to the powerful suction on the leeward side, a condition which does not exist with the streamline body.

Another experiment, which will aston-

ish the uninitiated, is the case of two discs on the same axis, spaced a certain distance apart, offering less resistance than a single one. The explanation is as simple as the phenomenon is startling. Two discs spaced at the proper distance apart approximate a cylinder with the air blowing against one end. We do not hesitate to believe a cylinder under such conditions offers less resistance than a disc of the same area because the cylinder more nearly approximates the shape of the streamline body. The secret lies in the spacing, since the second disc of the tandem must be located at a point so that the air flow over the two in tandem is smoother than over one separately. We soon learn that air can not be whirled about without using up energy, and that to conserve energy a body must pass through the air with a minimum of dis-

It is of interest to note that the two shapes, shown in the cut No. 6 and No. 13, are, respectively, the modern and original shapes used for Zeppelins. The resistances are very nearly equal because the diameter of the modern shape is greater. However, the volume and therefore the lifting capacity of the No. 6 shape is about 75% greater. Briefly, this means that for the same horsepower we could drive the No. 6 at the same speed as the No. 13, and at the same time have the advantage of greater lifting capacity. Of course, structural weight of the No. 6 shape might consume some of the 75% additional lift, but the net result would still be very favorable.

In running tests on a revolving cylinder, No. 10 in the cut, the tank is turned so that it is crosswise to the airflow. By spinning the cylinder with a cord, the so-called Magnus or Flettner effect is evident, for the float will travel laterally, necessitating the following of the model with the blower which is mounted on castors. Reversing the rotation brings about a reversal of direction.

#### Simultaneous Lift and Drag Tests

The two component balance simply weighs directly the forces of lift and drag. For convenience the surfaces are tested in an inverted position so that the pressure which would normally be lift is down. This permits the use of weights on the opposite end of the beam to balance the force. The diagram shows the resultant force R broken up into components L (lift) and D (drag).

#### Model Basin Test

By removing the cover of the tank and fixing the towing device in place it is possible to run tests which are highly informative. It is even possible to check the resistance of the same body in both air and water, using of course different velocities.

In the case of simple water tests, such as a pontoon skimming over the water in a partly immersed attitude, weights are placed in one of the pans. Time readings are taken covering that portion of the tank length where the velocity is uniform, that is, where the inertia resisting the starting has been overcome. Having the weight used for power, and the distance this weight travels, we have the foot pounds of energy used, and then having the time, we can calculate the horsepower expended. If the tests covered simply the selection of the better of two pontoons of the same general size it would only be necessary to determine which traveled faster under a given weight impulse in order to select the more efficient design, other things being equal.

#### Lift and Drag Curves

After a series of lift and drag tests have been run off on a wing, it is by all means desirable to plot a curve of the results. The most common method is to plot separate curves for lift and drag values against their angles of incidence. Lift

After this is done the 
$$\frac{DR}{Drag}$$
 curve is

plotted, which shows the efficiency at the various angles. Quite frequently a fourth curve is added covering center of pressure travel through the range of angles of incidence used in the tests.

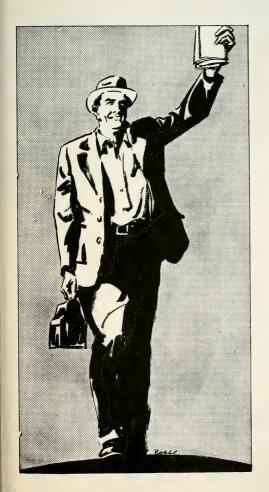
We are reproducing a chart showing the test results of three rather obsolete sections, which are, however, splendid for model work. They are R. A. F. (Royal Aircraft Factory) No. 3 and No. 6, and Eiffel No. 32. In this case the lift and drag values are covered by the same curve, while the angles of incidence are indicated on the curves. This method has many advantages of simplicity. For exmany advantages of simplicity. For ex-

curve may be quickly indicated by laying a straight edge from the lower righthand corner at the 0° point and noting where it intersects the scale at the top of the chart. In passing it might be well to mention that Eiffel No. 32 is known as a stable section because it has little or no center of pressure travel.

By way of explanation the actual coefficients of lift and drag are not as shown by Ky and Kx respectively. For simplicity the actual values have been multiplied by 10,000 in order to eliminate repetition of the zeros in the small decimal values.

It is hoped, as a direct result of our presentation of the Projansky and the Boeving balances, that our readers will undertake the construction of similar devices. Already we have learned of activity in this direction. With the winter months coming there will be an excellent period for such inside work. We can not help but feel that great discoveries, perhaps, revolutionary discoveries, await those who will undertake the study of low velocity air flow about various bodies. For the want of a better designation this might be called "Model Aerodynamics."

# Keep his head up and we'll all come through!



You recognize this man. He lives in your own town, not far from you . . .

Though faced with unemployment, he is combating adversity with courage. He has retreated step by step, but fighting. He has spread his slender resources as far as they will go.

This winter he and his family will need your help.

There are many other heads of families much like him in the United States. This winter all of them will need the help of their more fortunate neighbors.

This is an emergency. It is temporary. But it exists. It must be met with the hopefulness and resource typical of American conduct in emergencies.

Be ready! Right now in every city, town and village, funds are being gathered for local needs—through the established welfare and relief agencies, the Community Chest, or special Emergency Unemployment Committees...

The usual few dollars which we regularly give will this year not be enough. Those of us whose earnings have not been cut off can and must double, triple, quadruple our contributions.

By doing so we shall be doing the best possible service to ourselves. All that America needs right now is courage. We have the resources. We have the man power. We have the opportunity for world leadership.

Let's set an example to all the world. Let's lay the foundation for better days that are sure to come.

> The President's Organization on Unemployment Relief

## Walter S. Gifford

WALTER S. GIFFORD, DIRECTOR Committee on Mobilization of Relief Resources

#### Owen D. Young

OWEN D. YOUNG, CHAIRMAN

The President's Organization on Unemployment Relief is non-political and non-sectarian. Its purpose is to aid local needs. All facilities for the nation-wide program, including this advertisement, have been furnished to the Committee without cost. Compiled from reports from AERO DIGEST correspondents and the Aeronautics Trade Division, Bureau of Foreign and Domestic Comm

#### GERMANY

(EDWIN P. A. HEINZE)

THE "Furniture Van of the Air," the designation given in Germany to the new Junkers Ju.52 cargo airplane because of its very spacious freight hold, has been tested on floats with successful results. Canadian Airways, Ltd., has acquired one of these ships for its winter services in the Hudson Bay district.



High-Altitude Junkers

VARIOUS reports have been published relative to a high-altitude plane completed by the Junkers Works. The machine, the Ju.49, equipped with a Junkers L 88 engine of 800 horsepower is, contrary to these reports, by no means yet ready for highaltitude attempts. The machine is undergoing a prolonged series of tests at normal altitude and the engine has not yet had the blower fitted to it, which will form part of its ultimate equipment. The tests at high altitudes will not be started for some months to come

#### New Airship and Dock

THE new large hangar at Friedrichshafen for the construction and protection of the new Zeppelin is rapidly nearing completion. The structure has a length of more than 900 feet, a width of 190 feet and a height of 174 feet.

Work has been started on the erection of the new Zeppelin, the LZ 129, destined like its smaller sister ship, the Graf Zeppelin, for air transport work. The new Zeppelin will be filled with helium gas and powered with Maybach Diesel engines. It will measure in length 813.6 feet and will have a diameter in excess of 135 feet. The corresponding measurements of the Graf Zebbelin are 774 feet and 100 feet. The cubic contents of the new airship will be 2.152.860 cubic feet as compared with that of 1.474,000 of the Graf.

#### Light Plane Religibility Contest

THE German Aviation Union held its fourth annual reliability trial this fall, open to light airplanes flown by amateur pilots. This trial, which is a national one restricted to German crews and German planes with German engines, is rather unusual and interesting. Competitors may start at any flying field they desire and choose their own routes and destinations. Each machine must travel a distance equal to fifteen times that which it can normally cover in one hour, distributed as evenly as possible over three days.

Fifty machines were eligible. The number was limited because the funds at the disposal of the sponsors would not permit more taking part. Ninety-seven entries had to be refused. Upon entry the competitors stated the exact route they intended following, the fields at which they planned to land and finish and where they were to remain overnight. They had to provide their own fuel and obtain the necessary officers to certify at the various places of landing the time of their arrival and departure.

Points were also awarded for as many changes of crew as were possible. There were 300 crews for the fifty planes that were admitted. The idea was to have as many young pilots as possible try their skill.

First, second and third prizes were not awarded. Awards were made as mileage money. The machines which succeeded in completing each day their self-set task received 0.60 marks per kilometer flown, the air distances between the various fields at which the machines stopped being calculated. The German Transport Minister, however, presented a three-seater light plane to the club represented by the plane which landed at the largest number of flying fields and changed its crew most frequently.

When the contest began, forty-nine machines started from various ports all over Germany. Of these machines, thirty-five were owned by clubs and fourteen by private amateur fliers. These latter, however, were not required to change crews during the contest. Only eight machines succeeded in carrying through without failure the self-set schedule.

#### FRANCE

AN airplane with telescopic wings has been invented by Ivan Makhonine, a Russian engineer living in Paris. Among the purposes for which the new plane is designed are the increase of speed by reducing the amount of air resistance offered by the conventional type of wing. It is declared that an advantage of the telescopic wing is that it enables the large wing area, necessary for lifting a fully-loaded plane, to be reduced progressively as fuel is consumed and weight diminished.

VALUE of French aeronautical exports for the first seven months of 1931 totaled \$4 --090,598,40, a decrease over the same period in 1930, according to information recently made available. Of this amount, all but \$26,499 represented the purchase of landplanes. Siberia was the leading market for French aircraft. French aeronautical exports in 1930 totaled \$4,310,353,60. Aeronautical imports for the first seven months of this year, all from Czechoslovakia, were valued at \$51,469.60.

#### ENGLAND

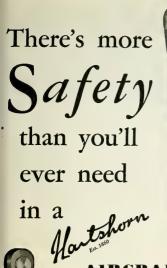
FLIGHT LIEUTENANT G. H. Stainforth established on September 29, a new world's speed record of 408.8 miles per hour average in five runs over a three-kilometer (17% miles) course on the Solent in a Supermarine S6B seaplane. The fastest lap was 415,2 miles per hour. He used an entirely new fuel and an engine built solely for the flight. (A description of the plane and engine used by Lieut. Stainforth will be found on page 48 of this issue.)

The former record of 379 miles per hour was established by Lieutenant Stainforth a few weeks previously on a flight over the Solent course.

THERE was an increase of thirty-six per cent in the amount of air mail transported by Great Britain during the second quarter of 1931 as compared with the corresponding period in 1930. A total of 27,996 pounds of air mail letters was dispatched from Great Britain during this period. More mail was carried from England to India than to any other one country. The traffic to European countries showed an increase of forty-four per cent over the same period last year. There was a slight decrease in the amount



Dornier Do. 10 military observation plane of the Swiss Air Force



AIRCRAFT TIE ROD

The most rigorous test agency in this country sets aircraft construction standards. Hartshorn Tie Rod standards are even more exacting.

Hartshorn Square Section Tie Rods absolutely prevent torsional strain in internal wing and fuselage bracing. If it's there, you see it and take it out. The flat faces save assembly time, for wrenches can be applied at any point along the rod and tight corners are no longer troublesome.

Hartshorn Streamline Tie Rods offer little wind resistance. They are strong, light and will not stretch. They increase speed, reduce fuel consumption and cut follow-up and lining-up costs.

Brace every ship you build or fly with

Hartshorn AIRCRAFT TIE RODS

STEWART HARTSHORN CO. 250 Fifth Avenue New York, N. Y. The man who has held back from purchasing an airplane because he wanted one that could land on his own grounds—

The man who has wanted a definite sense of security in flying — who is earnestly interested in aviation from a utilitarian standpoint—

These men represent the market hitherto untapped — the market now opened to you with the KELLETT AUTOGIRO.

KELLETT brings many refinements to the established principles of the autogiro, such as side-by-side seating.

A KELLETT demonstration is an almost certain sale. 1932 Demonstrators are now being delivered. We shall be glad to discuss our franchise with prospective distributors.



The descriptive folder, "Happy Landings," will be sent to you upon request.

# KELLETT AUTOGIRO

KELLETT AIRCRAFT CORPORATION
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ot parcels carried by air from England to European destinations, 40,327 pounds being carried in the second three months of this year as against 43,200 pounds in the same period last year.

IMPROVEMENTS in the winter flying schedules of the England-India and England-Arrica service of Imperial Airways were effected in October. Mail for India and Airica is being carried independently of each other and a bi-weekly service across the Mediterranean has been provided.

#### ITALY

AIR MINISTER Italo Balbo recently announced plans for a 'round-the-world flight by a fleet of twenty-four Italian military planes. It is said that the flight might start eastward from Rome and terminate with a transatlantic flight from New York to Rome.

Crews and pilots for the flight recently started training in the new air school at Orbetello, from where General Balbo led the flight of an air fleet to South America last January.

#### SWEDEN

THE "Viking," a new four-place, folding wing sport plane manufactured in Sweden, was placed on the market recently. The ship is produced as a landplane or a seaplane, the former having a load capacity of 849 pounds and the latter, 661 pounds. The wing span is 36.7 feet. With the wings folded the width is 13.8 feet. The plane is powered with an air-cooled Walter Castor engine of 240 horsepower. Wheel brakes and dual controls are provided.

#### CHINA

A SIKORSKY S-38 amphibion was recently purchased by General Chiang Kaishek, president of the National Government of China. The ship was delivered at Nanking by Major McConnel of New York. It is equipped with machine guns and other defensive armament. Marshal Chang Hsuehliang, governor of Manchuria, recently purchased a Ford trimotor transport which he often pilots himself.

Fifty-nine other planes have been delivered to the China National Government during the past few weeks, according to recent reports. Twenty-nine of these ships were of British make and most of the remainder were of American manufacture, now being used by the Nanking air fleet.

#### CANADA

CONTINUED development of Canadian aviation has resulted in the establishment and improvement of airports throughout the Dominion during the late summer. At Stevenson's Flying Field, Winnipeg, work has been started on a new hangar, as well as buildings for a post office, stock room, customs office, radio and meteorological stations. These buildings are being erected partly by Canadian Airways Limited, which operates the field for their air mail, passen-



Transferring air mail from a Royal mail plane of Canadian Airways to truck at St. Hubert Airport, Montreal, after a flight from Father Point, Quebec

ger and freight services extending north and west. Cost of the construction is \$30,000.

At Hamilton, Ontario, the government air club which uses the municipal field is lighting and building three new runways at a cost of \$60,000, part of which is being paid by the city. The runways will be 2000 feet in length. They will be surfaced with coalex and fine stone for 1,000 feet each and 500 feet on each end will be sown in grass.

REGULAR air passenger and freight service between Moncton and Charlottetown, P. E. I., was inaugurated on October 10 by Canadian Airways. Planes leave Moncton each day except Sunday at 8:30 a.m., reaching the island at 9:20 a.m., returning to Moncton at 1:50 p.m. Mail will be carried as usual during the winter months when steamer service across the strait is uncertain because of the ice.

#### AVIATION INDUSTRY IN BRITISH COLUMBIA

C OMMERCIAL aviation activities in British Columbia have shown a consistent increase and a net-work of airlines gradually is spreading out from Victoria over Eastern Canada and parts of the United States, according to a report recently issued by the American Vice Consul in Victoria, Nelson P. Meeks.

There are two air transport companies in the province operating scheduled planes. One American company maintains a branch factory in Vancouver. The operating companies are the Canadian Airways, Ltd., and the B. C. Coastal Airways, Ltd., with offices at Vancouver. Canadian Airways, in which the Canadian Pacific and the Canadian National Railways are said to be interested financially, maintains its main office in Montreal and operates a total of more than thirty-eight planes throughout the Dominion. Of this number, one Junkers W-34 Hornet and seven Boeing flying boats are operated in British Columbia, two being used in the daily passenger service between Vancouver and Victoria, B. C., and Seattle, Wash. This company supplies planes and pilots to the Provincial Government for photography. fisheries and forest patrol. B, C. Coastal Airways operates a daily passenger service to Seattle and a twice-daily service to Victoria. This company owns and operates one six-passenger Fairchild and one five-passenger Bellanca and has an option on a sixpassenger Junkers.

Landing fields are maintained in British Columbia by the following cities: Chilliwack, Fernie, Cranbook, Penticon, Prince George and Vancouver.

The municipal airport at Vancouver is located on Sea Island. The field has an area of 250 acres and is less than ten miles from the center of the city. Both hard-and

soft-surfaced runways and hangars for seaplanes and landplanes have been constructed at the airport. Seaplanes may land either in the channel at the airport or in Vancouver harbor.

It is reported that recently revised charges at the Vancouver airport are computed on the basis of the number of pounds of freight handled by airport employees, although no charge is made for planes carrying mail. The minimum charge for a plane using the port facilities with not more than a tenpassenger capacity on a schedule transportation run is \$45 per month. Visiting planes from other cities will be allowed to land without charge the first time. Itinerant airmen using the field for commercial operations, to the detriment of established companies, will be charged twenty per cent of their revenues from flights.

The Aero Club of British Columbia owns and operates a Moth plane and the Northern B. C. Airways at Prince Rupert also owns a Moth plane used primarily for instruction purposes. It is understood that the Consolidated Mining and Smelting Company possesses six planes at Trial, British Columbia, which are used in connection with the company's interests, and that the Royal Canadian Air Force has a complement of seventeen planes at Jericho Beach, Vancouver.

The Boeing Airplane Company maintains a branch factory in Vancouver, which manufactures seaplanes and landplanes. Last year five planes were produced in this plant, which is reported to have facilities for handling a maximum annual output of 100 planes. Engines for these machines are assembled and partially constructed in Montreal and shipped to Vancouver for installation

#### LATIN AMERICAN AVIATION

#### Aeronautical Exports to Latin America in July Valued at \$57,003

E XPORTS of aeronautical products from the United States to Latin American countries in July totaled \$\$57,003 in value. Of this amount, \$21,105 comprised the value of exports to Panama. These included one airplane at \$5,000, two aircraft engines totalling \$\$15,000 in value and \$1,105 worth of spare parts.

Brazil was the next largest buyer with \$16,915 worth of spare parts. Mexico, one of the largest Latin American buyers of American aircraft products, followed with total purchases valued at \$7,094. These comprised four airplanes valued at \$4,776, one engine at \$500 and \$1,818 worth of spare parts.

Other Latin American countries, which purchased spare parts exclusively, were as follows: Peru, \$5,212; Chuba, \$2,577; Chile, \$1,409; Colombia, \$1,009; Argentina, \$947; Guatemala, \$477; Trinidad and Tobago, \$300; and Honduras, \$58.

#### Chile Puts Air Corps First

THE Chilean Air Force has superseded the Chilean Navy as the first line of defense because of the victory of aircraft over surface vessels in the recent civil war involving the navy mutiny, according to recent advices. The navy has been reduced in size more than one-third and the budget for 1932 has been cut approximately \$3,000.00. Several thousand men and more than 200 officers are being discharged and the battle fleet has been taken from active service. It is expected that additional funds will be appropriated for the air arm as the national income permits.

#### Airline Opens New Service

AIR transport passenger service between Montevideo and Buenos Aires via Santiago was inaugurated in October by Pan-American-Grace Airways, thus opening the first regular direct passenger airline between New York and the Argentine capital. 'The new line makes possible a seven-day roundtrip passenger service between Montevideo and Buenos Aires and New York and Chicago via Miami with bi-weekly departures in each direction. Two years ago mail planes provided the South and Central American republics with direct and rapid communication. The success of this air mail service has encouraged sponsors to establish through passenger service to New York. Mail planes have been carrying passengers on the Santiago de Chile-Miami section but the first plane on the extended service inaugurated the first air passenger service over the Andes route.

#### Will Examine Air Travelers

ALL air passengers traveling over Peruvian territory are subject to medical inspection under the terms of a decree recently announced by the Peruvian Government.

Control stations have been established at Talara, Lima and Tacna. Arriving and departing airplanes will be inspected by the authorities. The cost of this service is chargeable to the commercial aviation companies operating the planes.

#### Latin American Airlines

REGULAR air transport services in Latin America are maintained over routes extending 34,882 miles. There is a total of seventeen operating companies, several of which are affiliated. A number of services are operated on daily schedules.

#### Booklet on Latin American Air Mail Service Published

THE National Foreign Trade Council, New York City, recently published a booklet, "Our Air Mail Service with Latin America—Where It Goes, Who Uses It, How It Builds Trade." The book was prepared "to promote the wider use of Inter-American air communication," and is intended to present in convenient form information to those interested in the development of American aviation.

Data is given on the various air mail routes and the facilities which are available to American business men. The contents include a recent map of the Latin American air mail lines, schedules of rates and routes and approximate weekly mileage. Figures on British and United States investments in Latin America and on imports and exports from the United States since 1913 are given.

#### Mexican Air Mail Continues

THE Postal Department of Mexico recently decided that air mail service would have to be suspended for lack of funds with which to meet expenses until the new budget became effective. However, before the decision went into effect, a temporary allocation of funds was made by the Mexican Ministry of Finance to permit continuance of the international and domestic air mail services.

#### Buy French Aircraft

PURCHASE of fourteen French airplanes for the use of the army flying school
was recently announced by the Uruguayan
Government. The planes were bought
through the French Legation at Montevideo.
The manufacturers extended long term credit.

#### Gliding in Argenting

IN Argentina there are two glider clubs both in Buenos Aires. One is the Club Argentino de Planeadores Albatros and the other the Asociacion de Vuelo sin Motor. The first of these clubs is the more active with a membership of 100 and has two gliders; a Detroit "Gull" primary and a "Kassel", a German secondary glider. Students are instructed by two powered-plane pilots.

#### Good-Will Flight

A GOOD-WILL flight from Roosevelt Field, N. Y., to Caracas, Venezuela, was undertaken last month by J. Pocaterra, Venezuelan pilot, and L. Hoover, American mechanic. They landed at Mexico City, Mexico, on October 20, en route for Venezuela.

#### South American Sales Tour

A SALES TOUR of nine weeks in South America was recently completed by Warren L. Baker, sales and advertising manager of the Glenn L. Martin Company, Baltimore, Md. He traveled a total distance of approximately 11,500 miles and visited Brazil, Uruguay, Chile, Peru, Colombia, Venezuela and Panama. Mr. Baker said that he was received cordially by the military officials whom it was his mission to interview in the various countries visited.

#### THE C. A. T. AIRLINES OF MEXICO

ONE of the principal airlines in Mexico is the Compania Aeronautica de Transportes, or C. A. T. Airlines, with headquarters at Torreón, Coah. Steady increases in the number of air passengers and in mail and freight poundage have been reported by the company during its two and one-half years of existence. The line has in operation eleven Lockeed Vegas, each powered with a 420-horsepower Wasp engine and having a capacity of six passengers and pilot. Ten American pilots and a staff of thirty-four are employed.

There were 4,421 paying passengers carried by the airline during the first six months of this year as compared with 2,283 passengers for the same period in 1930, an increase of approximately 100 per cent. Air mail transported by the airline in the first half of 1931 increased more than 100 per cent over the same period last year, from 9,854 pounds to 18,950 pounds. Express increased more than 600 per cent, from 3,129 pounds to 20,709 pounds. At the first of this year,

air freight service was inaugurated by the company, 331,009 pounds being carried in

the first half of 1931.

Last year C. A. T. accomplished 3,000 flights into and out of Torreón and the sixteen other cities served by the airline, without a serious accident.

Air mail from the United States is delivered directly to seventeen of the most important cities in Mexico on the same day that it crosses the border. C. A. T. planes make connections with the main air routes of the United States at El Paso and Brownsville, Texas.

The company also serves the San Luis Mining Company at Tayoltita, Durangol carrying 2,000 pounds of silver and gold bullion daily from the mine in the Sierra Madre Mountains to Mazatlán, Sinola, a distance of 100 miles. Into Tayoltita, C. A. T. planes carry daily loads averaging 3,500 pounds, comprised of materials used in mining processes, food stuffs, machinery and passengers.

# Choose a flying school backed by LEADERS of the industry!

XECUTIVES of the United Aircraft & Transport Corp. planned Boeing School courses—to give you exactly the kind of training the industry will demand. These men are acknowledged leaders in airplane design and manufacture and in transport operations. From daily experience they know why some beginners fail and why others succeed.

Likewise, the 18 instructors are practical, successful men, who know the vast difference between a headful of theories and what you'll need when you tackle your first job. These veteran air mail and army pilots and technical specialists of long experience were attracted to the Boeing School by its prestige and by its unequalled laboratory, shop and flying equipment. Learn to fly... now... under these ideal conditions, with individualized instruction. Your ground school will include—besides the usual subjects—intensive instruction in advanced meteorology and aviation, instrument flying, aerodynamics, air transport operating practices and other vital subjects. You will fly five types of training planes, including a 3-ton transport. No engine less than 150 H. P.

The high percentage of Boeing graduates employed by the industry demonstrates the confidence of responsible companies in Boeing training. Mail the coupon below—today—for full details.

# BOEING SCHOOL OF AERONAUTICS

Division of United Aircraft & Transport Corp.

| BOEING SCHOOL OF AERONAUTICS Room 11-A, Airport, Oakland, California                                                                                              |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Gentlemen: I am interested in   Private Pilot   Boeing Master Pilot   Boeing Master Mechanic   Special Master Pilot   Special Master Pilot   For Transport Pilots |
| Name                                                                                                                                                              |
| Address                                                                                                                                                           |
| CityState                                                                                                                                                         |
|                                                                                                                                                                   |

#### RAPID AIR NAVIGATION

(Continued from page 31)

with L 43° Enter table where declination has same name as latitude d 5° and pick out hour angle, azimuth, and corrections for 1' of h 46° declination.

Thus:

| HA<br>Corr, | (+) | 1   | 40<br>3  | 18<br>06.3   | Secs.<br>7.7<br>24.2 | Az.<br>Corr. | (—) |   | 142°<br>1°   | .6<br>.3 |
|-------------|-----|-----|----------|--------------|----------------------|--------------|-----|---|--------------|----------|
| LHA<br>GHA  |     | 1 5 | 43<br>01 | 24.3<br>46.5 | 154<br>308           | Z<br>Az      |     | N | 141°<br>218° | .3W      |
| Long.       |     | 3   | 18       | 22.2W        | 154                  |              |     |   |              |          |
| Arc         |     | 49  | 35       | 30 W         | 186.34               |              |     |   |              |          |

Draw preliminary line of position through a geographical position in latitude 43° N, longitude 51° 08′ 7 W, at right angles to 216° .1 and transfer parallel to itself for a distance of 13′ .4 toward the bearing of the star since the corrected measured altitude is 46° 13′ 22″, which is 13′ .4 more than the altitude 46° employed in entering the tables.

Dreisonstok's Method (Navigation Tables for Mariners and Aviators H. O. No. 208)

The assumed position in this case is at latitude 43° longitude 50° 26′ .6.

The altitude difference is 10' .2 (away) and the azimuth 217° .5.

Pierce's Method (Position Tables for Aerial and Surface Navigation H. O. No. 209)

Enter Table II, with D =  $25^{\circ}$  and V' =  $27^{\circ}$ then hc =  $46^{\circ}$  22' Z = N142° W then bo =  $\frac{46}{13}$   $\frac{13}{4}$  Z = N142° W 8.6 (A) Az, 218° Lay off from assumed position Lat. 42° 57'.1 N, Long. 50 19.5 W.

AGETON'S METHOD (Dead Reckoning Altitude and Azımuth Table HO.No.21)

| GST<br>RA★           | 12h     | - 37 <sup>m</sup><br>35 | -  | 283  |        |                       |   |                   |    |        |                     |    |
|----------------------|---------|-------------------------|----|------|--------|-----------------------|---|-------------------|----|--------|---------------------|----|
| GHA®<br>GHA®<br>Long | 975°    | 01<br>26/6<br>04.2      |    | 46.5 |        |                       |   |                   |    |        |                     |    |
| LHA.<br>Dec.         |         | 22.4                    | W  |      | A<br>B | Add<br>36801<br>193.5 |   | ubtract<br>102604 |    | Add    | Azimuth<br>Subtract |    |
| R                    | _       |                         | -  |      | Α      | 36994.5               | В | 4364              | В  | 4364   | A36994.5            | ,  |
| K<br>Lat.            | 5<br>42 | 57.9<br>52.1            |    |      |        |                       | Α | 98340             |    |        |                     |    |
| K~L                  | 36      | 54.2                    |    |      |        |                       |   |                   | В  | 9708   |                     |    |
| hc                   | 46      | 19.5                    |    |      |        |                       |   |                   | Α  | 14072  | B 16079             |    |
| ho .                 | 46      | 13.4                    |    |      |        |                       |   |                   |    |        | A 20915.5           | 5  |
| a                    |         | 6:1                     | aw | ray  |        |                       |   | <u>Z</u> ,        | 12 | 8-09.5 | Zn 14 1-50.5        | ,~ |

(Continued on following page)

NOVEMBER, 1931



It's air hours you pay for — and air hours you get — in a Boeing airplane! More than 20 million miles have been flown by Boeing mail and passenger planes over United Air Lines alone — a record of consistent, everyday service that speaks for the quality of Boeing construction. Boeing stamina is assurance of longer life — and more hours in the air! . . . Boeing Airplane Company, Seattle, Subsidiary Of United Aircraft and Transport Corporation.





# THE WACO AIRCRAFT COMPANY

AN OPEN LETTER TO SALES EXECUTIVES

Let's get down to brass tacks, without any proliminary

1. It may surprise you to know that the operating cost of a Waco Cabin "Model of 4s little if any more than that of your succeed in a state of 1s and the state of 1s and 1s

2. With this WACO at your command you can get around the circuit two or three times as fast, and give your men the personal impiration that means to such in these strengous times. What would that mean survival law to cotte sales and added proof, the

7. There is some value in the dramatics of the thing, too. One contract that you landed by being literally a jump shead of competition might pay for the whole investment. Right?

It will cost you only a 2d stamp to call for a showdown. Tell your accretary to drop me a note asking for the proof. I can give it to you in writing. And our distributor in your neighborhood can give it to you in the air. Say when, won't you?



The complete WACO line ranges from \$4450 to \$8525, with Heywood starter standard equipment on all models.

Deferred payments can be arranged. And purchase of a new WACO includes any needed instruction. See your distributor for details.

THE WACO AIRCRAFT COMPANY, TROY, OHIO



There are more WACOs in private service than any other American make



(Continued from preceding page)
Aquino's Method (Aquino's Newest Sea and Air Naviga-

DR (Lat. 42° S1° NW

Dec. 52 S

Weems' Method (Line of Position Book).

To find azimuth from Rust's Diagram.

Goodwin's Method (The Alpha, Beta, Gamma Navigation Tables).

6.6(A)

Practically the same as Marc St. Hilare and from same point. Uses Rust's Azimuth Diagram to obtain the azimuth.

Summary of the Above Methods

| Method               | Entries<br>to<br>Tables | Additions<br>and<br>Subtractions | Remarks                           |
|----------------------|-------------------------|----------------------------------|-----------------------------------|
| Marc St. Hilare      | 7                       | 7                                | Separate Use of<br>Azimuth Tables |
| Littlehales H.O. 203 | 2                       | 6                                | Gives h and Z                     |
| Dreisonstok H.O. 208 | 4                       | 4                                | 66 66 66 66                       |
| Pierce H.O. 209      | 2                       | 2                                | 44 41 44 44                       |
| Ageton H.O. 211      | 7                       | 6                                | 66 66 66 66                       |
| Aguino               | 3                       | 5                                | 46 46 66 66                       |
| Weems                | 4                       | 2                                | Use dividers to get               |
| Goodwin, ABC         | 6                       | 4                                |                                   |

#### EUROPEAN AIRLINES

(Continued from page 37)

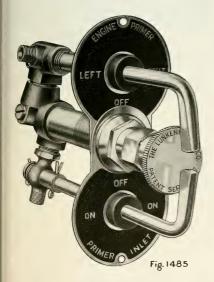
necessity and advisability of furnishing this information to the passenger and it is not put up in form for use by a visiting pilot.

There is a first class hotel about 100 yards from the central building, owned and operated by one of the local brew-

(Continued on following page)

# LUNKENHEIMER AIRCRAFT SPECIALTIES

ANew
AIR CORPS PRIMER



FOR TWO ENGINE BOMBING PLANES



THE LUNKENHEIMER CO.

"QUALITY"

CINCINNATI, OHIO. U. S. A.

NEW YORK CHICAGO BOSTON PHILADELPHIA





CRANKCASE FOR RADIAL ENGINE MACHINED COMPLETE

Govro-Nelson



THE machining of the crankcase and other vital parts of an aircraft engine should not be entrusted to inexperienced hands.

The crankcase built for a 200 h.p. Diesel Radial engine shown above as a sample of Govro-Nelson work, was expertly machined by skilled, experienced workmen—keyed to the demands of the aviation industry, working with the aid of modern manufacturing machines and accurate testing equipment.

GOVRO-NELSON

931 ANTOINETTE DETROIT

CRAFTSMEN TO THE AVIATION INDUSTRY



in the nation's newest plane The

# PILGRIM 100-A

### Transport Airplane

Developed to suit today's transportation needs-not designer's prejudice.



A full load from Dallas on the American Airways service to Brownsville

First operated Dallas-Brownsville, - a week later Chicago-St. Louis (four round trips daily), and now on a twice-aday schedule beween Chicago - Cincinnati.

Everywhere the same story is heard . . . .

Passengers say: "That's real travel SERVICE!" Pilots say "It's a pilot's plane!"

Operators say: "Now, I can make a PROFIT!"

## AMERICAN AIRPLANE & ENGINE CORPORATION

Manufacturing Division of The Aviation Corporation FARMINGDALE, L. I.

Manufacturers of PILGRIM Airplanes and RANGER Engines

(Continued from breceding bage)

eries. The entire layout is adequate to serve the passenger's needs without being overdone. There is an arrival and departure gate at the terminal and of course the usual customs and passport inspection point for the incoming and outgoing passengers. The usual hustle and bustle about the terminal building noticed at an American airport is entirely missing for the reason that the time factor is not as important to the European in air travel.

There is a tower on top of the central building with an outdoor balcony around it. All personnel in this tower are employees of the British Air Ministry. The visual signaling devices are very simple. Large metal plaques with printed figures are shown to a pilot to tell him his take-off order if several take-offs are scheduled at the same time. A high-intensity searchlight is flashed on him when he is in a position to take off, as a signal to proceed. On foggy days when a plane is heard over the airport, a gun fires a flare straight up to about a thousand feet, which gives off a kind of yellow glow and if seen by the pilot locates the position of the airport. The shell is not a parachute type but the flare is supposed to be consumed by the time it hits the earth. A Luft Hansa plane made use of this device while I was at the airport. Radio would do it better, but it was explained to me that the trailing antenna was usually wound in by the time the pilot had reached the approximate airport position. Two Very pistols on the tower complete the visual signalling equipment.

All apparatus is controlled from the tower and is therefore under Air Ministry control. The transmitters (three kilowatts) are remoted from a point two miles distant. The purpose of the radio communication is: (1) to transmit pertinent information to the pilot in flight; (2) to receive position reports from the pilot in flight; (3) to give pilots their location on request while in flight, commonly called "direction finding." The control tower handles all communication to and from aircraft to the French side of the Channel. Flying over the Channel may be said, therefore, to be under Air Ministry control, but that does not mean that it is an Air Ministry responsibility because the pilot is not required to accept orders from the agency.

The control officer talked to me at length on the subject and stated that he hopes to see regulations compelling all lines to obey an order to turn back or sit down. His concern is mainly that if they proceed toward Croydon in the face of broadcast information to the effect that conditions are impossible, they invariably get into difficulties requiring constant use of the transmitter and its one channel, thereby blanking out all communications to and from others.

All communications to and from aircraft are conducted on 900 meters or 333 kilocycles, which is the international calling and operating frequency. It is obvious that such a channel is totally inadequate to carry the entire burden at points like Croydon. The idea is entirely sound; a plane equipped to transmit and receive on 333 kilocycles may fly anywhere in Europe and communicate two-way with the ground. However, at points like London, Paris and Berlin, with five or six nationalities operating into the port, jamming results.

Radiophone is used by all lines but the German. All lines operating into Croydon have English-speaking pilots except the French, and they insist on French with the result that the operators at Croydon use French. The Germans may or may not know English, but they get by nicely on Q

The tower control seems to be geared up to three important radio duties, as follows: (1) to check the pilot when (Continued on following page)

# Ready for Action! EDO FLOATS



HE bird dog sniffs the air...rifle and shotgun are put into pink of condition...camp duffle is gathered...the hunting season is at hand and soon sportsmen will seek the wooded lakes and marshy shores where game abounds.

EDO Float equipped planes, for charter to sportsmen who seek the quickest way to their favorite haunts, are yearly paying goodly profits. Transport operators have ample time to install EDO Floats on their land equipment. Complete installations are promptly available for over 40 types of land planes, licensed in Canada and the United States—more than all other makes of floats combined. For full details, address: EDO Aircraft Corporation, 610 Second Street, College Point, Long Island, N. Y.



Atypical EDO Float installation complete with water rudders and all attachments, ready to install on a land plane.

#### POINTS OF

**EDO SUPERIORITY** All metal construction. Anodically treated against corrosion. Will not swell, shrink or absorb water. Patented fluted bottoms for quick take-off. Heavy keels, shallow sterns for beaching. Flat decks for ease of taking on loads. Automatic Retracting water rudders Wide sterns for perfect taxying. Easy to install and overhaul.

Address





THIS ONE WAS ERECTED TAKEN DOWN AND RE-ERECTED ON THE FINE

BRATTLEBORO, VT.

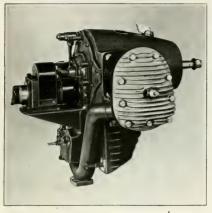
Sies AND TYPES FOR ALL PRIVATE AND COMMERCIAL PURPOSES

Fred H. Harris, officer in U. S. Naval aviation during the war, now in the business of investments and a private airplane owner, moved this Butler Ready-made Steel Hangar from Greenfield to his home airport, Brattleboro, Vermont. In its setting on a grass-sown 80x100 foot plot, landscaped with evergreens and ferns, this is a hangar of which its owner is justly proud.

Butler Ready-made Steel Hangar sizes range up to commercial airport types with clear spans of 100 feet or more. Transport line stations, flying school hangars, training quarters, aircraft factories, equipment warehouses and repair shops are some of the many air industry purposes served by Butler Ready-made Steel Buildings. Butler designs include round and gable roofs and combinations of steel and stucco and steel and brick veneer and afford the economical solution of most every aircraft sheltering problem.

| ize x    |  |  |  |
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| lemarks  |  |  |  |
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| 2.,      |  |  |  |

# The Motor that has thoroughly proven its reliability » »



« « IS now

#### available to all light plane builders

When we offer an AERONCA MOTOR to a buyer, we offer a motor that has withstood he test of time. For two years the AERONCA E-107A has flown hundreds of AERONCA airplanes in all parts of the United States and foreign countries. It has achieved cross-country records which have not even been approached by other light planes. If has taken pilots across stretches of land which they would not think of navigating with other types of engines. It has flown AERONCA owners from the Atlantic to the Pacific at operating costs which are ridiculously low. As an actual instance, an AERONCA MOTOR carried Frank Kammer from Cincinati to Wenatchee, Washington—a distance of 2,000 miles, with mountains reaching up to 12,000 feet—at a cost of just a little more than \$15.00.

An AERONCA MOTOR flow the AERONCA plane which achieved the distinction of being the first light airplane to ever complete a National Air Tour. And this AERONCA MOTOR was not especially prepared. As a matter of fact, it had just come back from a 13,000 mile demonstration tour and was sent off to Detroit without even a valve grind. At Detroit that used motor actually obtained for the AERONCA the highest figure of merit of any ship in the Tour.

If you want this same fool-proof performance in your light plane—this same efficiency, economy and absolute reliability—you can obtain it by powering your hip with an ARCNICA ENGINE. The initial cost is no higher than demanded for other light plane motors... but with twice the life, the cost per flying hour is really only half as much. Write for complete details today!



Aeronautical Corporation of America

(Continued from preceding page)

he reaches the Channel and when he is across; (2) to give direction while over the Channel; (3) to see what aid is sent to any aircraft making an emergency landing in the Channel. Quite an elaborate system is maintained so that in the event that a pilot reports an emergency landing a fast motor boat will be dispatched within two or three minutes of the receipt of the report. I do not think this part of the service is advertised, but it is certainly a necessity when flying landplanes over water.

Croydon uses two other intermediate frequencies—one for point to point and one for meteorological. Jamming has resulted from the fact that some of the French stations either cannot or will not shift from 333 when communicating other than with aircraft. No high frequencies are in use regularly. Last year, when static was bad, an experimental high frequency point-to-point circuit was tried out between several of the English airdromes, using fifty-six and 110 meters.

In regard to the direction finding system, I am convinced that it works satisfactorily. I am not convinced, however, that it is the final answer because it depends upon the performance of the plane transmitters. The procedure is as follows: the aircraft notifies Croydon that it wishes to obtain its position. Croydon tells it to go ahead and transmit for thirty seconds, notifying the other two stations at the same time to obtain bearings. The other two send Croydon the bearing and from the master map these bearings are run with string. The craft is at the point of intersection of the three strings and the position is telephoned to the pilot, usually within two minutes. The position as given is not by sector or in nautical terms, but so many miles in a certain direction from a known landmark. The pilot has to make correction for the elapsed time between the sent and received time.

On the flight from Croydon I had ample proof that the system works well. Certainly one thing is apparent: it is much cheaper. The international telephone distress signal, "Mayday," while unknown in America, is well-known there and usually precedes a request for bearing over the Channel in thick weather. Except for jamming, this would not be necessary, but as one person said, it is about the only way the Frenchmen could be made to be quiet.

The control tower officer told me that several planes were struck by lightning last year. I questioned him closely and am of the opinion that the long trailing antenna picked up heavy charges that burnt up the radio. In one case the plane caught fire; in all cases, he said, emergency landings were necessary. This point should be well looked into by the American engineers.

The radio equipment in the planes is all developed for intermediate frequency, a band in which American lines are not particularly interested. The sets are about of the same weights as those we have. The receivers are not of remote control type, and there are no single push-button controls. There is little or no shielding and very little bonding. Power supplies are wind driven. The microphones have been adapted from land types. Each pilot has used his own ingenuity to rig up his own radio harness to keep it from getting tangled up. He puts it on before he gets in the plane and plugs it in when he sits down. Ordinary headphones are used.

One trip I made was a flight of 670 miles between London and Copenhagen, a journey taking nine hours and fitteen minutes, which revealed pertinent facts on European transport methods. A ticket for my trip over K. L. M. on their Scandinavian express was purchased the previous day. Pick-up at the downtown hotel was one hour before the

departure at Croydon. Free bus transportation was furnished. The attendants weighed both my baggage and myself, but ignored the fact that the total was at least twenty pounds overweight. Take-off was made exactly on time in a Fokker F8, a two-motored plane powered with Bristol Jupiters. There were nine passengers. The ceiling was 200 feet and the visibility about three-quarters of a mile, so we were blind right off the ground. We climbed to about 2,000 feet, when we came out with another layer above, which soon closed in. Finally, we came out at 4,500 feet. No breaks in clouds were encountered for the first forty-five minutes, after which we came into broken overeast and five mile visibility. We were exactly on our course, the direction finding system having been used once to correct for drift.

As we reached the Channel at Folkestone the pilot reported position. About half-way across he asked me to come into the cockpit, and when we reached the French side he turned the ship and radio over to me. We reported position at Calais, but flew the water (beyond gliding distance) to the Holland border. At Rotterdam the freight was removed from the passenger cabin and placed in a nose compartment, and the passenger load was increased from nine to fourteen, extra chairs being put in. The ship is rated at sixteen passengers maximum.

Amsterdam was reached at 12:35 p. m., with an hour for lunch. The ship was changed here to another of the same type. The port at Amsterdam is a good average port with grass surface. It is marked municipal, but the buildings are all K. L. M. There is everything a passenger needs in convenience, and the food is excellent.

We proceeded to Hamburg, which is by far the best airport both in size and equipment yet seen. There were fully 5,000 visitors at the port, just looking and eating pretzels and drinking beer. There was about one policeman on guard for every four people. Sight-seeing flights were active, two Junkers being used. After one hour we proceeded to Copenhagen, arriving at 6:15 p. m. The port at Copenhagen is good, grass surfaced.

Passengers en route are left entirely to their own resources. During the entire trip no member of the crew was in the cabin. The usual facilities for airsickness were available. There were no magazines or reading matter. A fine strip map of the trip could be purchased for fifty cents.

The K. L. M. operation seems to be well organized. Pilots probably depend upon their motors more than is done in America. Steep banks seem to be in order both on landing and or take-offs.

The weather after the first fifty minutes was good all the way. After we cleared the thick area and after leaving the Channel, the radio was used only to report about ten minutes before each landing. An immediate acknowledgment was always forthcoming. Each of the ports (Rotterdam, Amsterdam, Hamburg and Copenhagen) was equipped for mobile and fixed service. Except for Hamburg the equipment was on the port; at Hamburg it is near the port and remoted from the administration building.

#### COMING OUT OF IT

(Continued from page 33)

gins to take hold of us again, we are coming out of it. We shall put our money back in the banks, believing that they will still be there when we need it. We shall buy goods again, not only because we need them but because we are looking ahead. We shall invest in bold and speculative enterprises because we believe in their future. We shall bite

(Continued on following page)

# It cost Herkless \$35. to solo in 31/2 hours » »



« « and the

#### club earned \$21. in absolute profit

Herkless is one of the fifty-eight members who enrolled last month in an Aeronca Flying Club. His training time is just average and he paid as he learned . . . at \$10 an hour. Now he files solo at \$7.00 an hour and is out for a transport license . . . an ambition he's had for years, but never could afford before.

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(Continued from preceding page)

off more than we can chew, because we know our appetites and capacities are on the up-and-up. And that, friends and customers, will mean the end of the depression.

This proves, if it proves anything, that aviation was right in the first place. It was right in counting on what is to come, even though it is difficult to discount it at the present. Its mood has been constructive from the beginning, which is more than can be said for that of its critics. It has looked ahead, having nowhere else to look, and is still looking there, though the visibility is not as good as it might be.

The friend and partner of aviation in the present condition of affairs is that same average American who has been publicly commended in this dissertation. He has had his bad moments, he has been seriously scared, and to some extent his pocket has been picked. But now that the worst is over, he looks ahead again, because that is his habit and inborn disposition. It may be, for all we know, the congenital habit of the whole human race. And if so, then the world cannot go backwards into chaos and savagery, though some of the philosophers and economists are worrying themselves sick over the prospect. And as soon as the world goes ahead again, aviation will come into its own.

When the last war was over at last, there arose another among those who felt bound to decide who started it. It is nearly time now for quarrel and controversy among the experts who think they know what started the depression. There are plenty of candidates for the nomination. It may have been the World War itself, or the gold shortage, or the women's short skirts, or the prevailing popularity of pyorrhea. It may have been prohibition, or international politics, or the shortage of real contenders in the heavy-weight division. It may have been the flop of the gold standard, or the weather in Western Australia.

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DEPENDABILITY

SIMPLICITY

ACCESSIBILITY

#### AIR - HOT AND OTHERWISE

(Continued from page 34)

Colonel Clarence M. Young, Assistant Secretary of Commerce for Aviation, states that the public now accepts air transport as a normal desirable means of getting from here to there or coming back and upon a purely business basis. Glamour is diminished. Adventure is subordinated. Air transportation is just the fastest and about the most comfortable way of "going places," and, as such, is regarded as desirable by a constantly increasing number of citizens. After a 65,000-mile inspection flight over the Federal Airway System Colonel Young says that the people now have a practical interest in flying, no longer considering it a stunt or novelty.

#### I SEE BY THE PAPERS

(Continued from page 28)

they started off. He invariably is

66 P ORN seventy years too soon!" should be cut on the stone beneath which rest the remains of Jean Francois Gravelet, known to fame in the sixties as Blondin. If he was alive to-day he would be an ocean flier, and the king of them all.

It was in 1859, at the age of 35, that he crossed Niagara Falls on a tight rope, 1,100 feet long, and 160 feet above the water. He performed this feat a number of times after that, always with different theatric variations. He went blindfold, in a sack, trundling a wheelbarrow, carrying a man on his back, on stilts, and finally sitting down midway while he made and ate an omelette. Then he appeared at the Crystal Palace, London, turning somersaults on stilts on a rope stretched across the central hall, 170 feet above the ground. He died peacefully in bed, with his boots off, in 1897, at the age of 73. He was the greatest purveyor of thrills the world has ever known, not excluding Dick Grace, king of the movie crash pilots—whose book, "I Am Still Alive," is warmly recommended to your attention. Read it soon, lest the title get out of date.

Well, it seems to me that Blondin would have shown these ocean hoppers a trick or two. They're doing with an airplane what he did with a tight rope, only they're not doing it nearly so well. Blondin never waited for weather; he never disappointed a crowd; never got lost; never landed en route; and never had a publicity man. They weren't invented at that time. Blondin's greatest stunt perhaps was to cross the Falls with a man on his back. The nearest approach to him to-day is Clarence Chamberlin, who flew across the Atlantic with Levine on his neck.

WHILE a hunt was in progress for an airplane apparently stolen from a flying field, a detective on the case announced that he suspected the existence of a ring which planned to steal planes, change the identification marks, and sell them. If the ring manages to sell any of the planes, they might be good enough to inform the regular distributors how the trick is accomplished.

HAVE you been keeping up with the Joneses? I had you think I found him? On the radio page, as headliner on the Jarman Shoe program. He started off at the National Air Races, with fifteen minutes, in which he introduced half a dozen famous pilots. The following week, he had ten minutes and introduced three famous pilots. The week after that he had five minutes and introduced.

one pilot. The other minutes on the program were devoted to music and a crooner.

Well, last week he was down to three minutes and no other pilot, the orchestra and the announcer and the crooner having got the other twelve minutes away from him. I am waiting patiently for next week, to see if there is any further drop in the stock of Radio Jones, Inc. He seems, like the dividends on common stocks, to be subject to the laws of diminishing returns. If this sort of thing keeps up, Casey Jones will be back at the throttle of old 97.

I SEE where the French have devised a new silencer for airplanes, and they have a paint that makes the plane invisible at night. You can't see it; you can't hear it. It rether resembles the N.A.A.

E VERY now and then I run across an enthusiastic newspaper account of the marvelous aids to the conquest of the air that are being handed to the pilot. The inference is that flying now is so simple, thanks to these amazing inventions, that practically all a pilot has to do is to climb into the airplane and go—his hardest labor being in hoisting himself into the cockpit. After that he merely sits there and dozes while the mechanical pilot keeps the craft straight, the radio keeps him on his course, the instruments all function, every one of them, and the de-icer throws off any ice that may form.

Naturally, these instruments are essential to bad weather flying—none could be done without them. However—From a United Press dispatch last March: "Lost in a swirling snowstorm, his plane coated with ice, Verne Treat, veteran pilot of the night air mail, jumped for his life late last night. Treat left Camden, N. J., at 10 p.m. on his regular run to Richmond, Va. The weather reports were fairly good. Soon, however, he plunged into a heavy snowstorm. Near Baltimore the snow clogged some of his instruments. Treat lost his directions. Desperately he tried to climb above the storm.

"Then ice began to coat the wings. At 4,000 feet the plane became unmanageable, and spun down to 3,000 feet. Again Treat tried to point his ship upward out of the storm. The craft climbed only a few hundred feet, then plunged downard again. At 1,500 feet Treat shut off the gasoline and stepped out."

The cold turkey about these essential aids to the navigation of the air is that any one or more of them may cease to function at a critical moment, and leave the pilot with nothing but his experience and common sense to fall back upon. Snow and vibration get in their licks at the instruments; sleet forms into ice and forces the plane down. And finally, there is weather that no airplane will fly through even with all the latest inventions functioning perfectly.

The most valuable invention of the lot is an experienced and thoroughly capable pilot—who is permitted to use his own judgment while in the air, and who isn't driven by a combination of causes to force an airplane to attempt what it isn't capable of performing with any large assurance of safety. You airline pilots have my permission to cut that last sentence out and present it to your operations manager with my compliments.

HEADLINE: GERMAN GIRLS AVERSE TO MARRYING AIRMEN. All American pilots who have been married over a year, and who now wish Amer-

ican girls had been more like German girls, will please rise. What! Is nobody sitting down?

I SEE by the papers that no Scotchman has ever attempted a long distance flight. He just can't bear to burn up that much gas.

You know our prevailing winds are westerly. Well, there was a Scotchman at Roosevelt Field who waited a month for an east wind so he could fly to Chicago with a wind on his tail, and save gas. The last I heard of him he had just left Bellefonte—walking. He carried a pair of field glasses, but only looked through them once a day. He didn't want to wear out the lens. That was the bird who ordered for breakfast ham and one egg. Then he'd look at his plate cross-eyed and see ham and eggs. You can't beat those Scotchmen.

FAMOUS last words of a Naval Lieutenant, Junior Grade: "Admiral, can I sell you a ticket to the Aircraft Show?"

WHAT'S happened to the tree sitters of a year ago? The endurance bicycle races? The refueling endurance contests, and the flag-pole sitters? All gone, apparently. I haven't run across them in the papers, anyhow. Last summer evidently wasn't a good season for them, though other bugs were here in profusion. The caterpillars took over the tree-sitting activities, and removed practically all of the foliage from my Oriental Plane trees; the crickets kept up a musical endurance contest all night; and the mosquitoes hummed along with all of the persistence of the non-stop bicycle races. So everything balanced.

There were comparatively few long distance flights and

only one dance marathon. In fact, science made practically no advances this last summer.

#### DISTRIBUTION OF LIFT (Continued from page 32)

The constant moment coefficient with respect to the aero-dynamic center is indicated in the plot of the air forces by the intersection of the moment curve and the axis for zero lift. In practice it is advisable first to draw the mean straight line through all plotted points, for the moment curve will not be absolutely straight and just at very small lift coefficients it may deviate from its general straight course. The intersection of the axis with this mean straight line gives better results than the intersection with the original moment curve itself.

Both relations hold only up to the burbling point. When that is reached, the center of pressure of the monoplane moves back. The foremost center of pressure location is therefore identical with the center of pressure at the maximum lift coefficient. It can be computed by determining the center of pressure allocated by theory to the

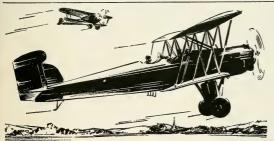
maximum lift coefficient. This is  $24\% + 100 \frac{\propto e\pi/2}{C_{\text{f. max}}}$  because

twenty-four per cent is the aerodynamic center. The maximum lift coefficient was seen in the preceding article to be approximately Ci  $_{\max}{=}1{+}0.05\Omega$  where  $\Omega$  denotes the trailing angle in degrees. A formula for the computation of the foremost center of pressure is therefore

Foremost center of pressure=24%+100-

 $1 + 0.05\Omega$ .

(Continued on following page)



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(Continued from preceding page)

This formula does not yield a result of absolute correctness. Neither does a model test, because the value is influenced by secondary effects, friction, interference, and scale effects. The Department of Commerce specifies a wind tunnel test for each new wing section employed for the determination of the center of pressure, and particularly the foremost center of pressure. This specified requirement is often burdensome, and may quite well be replaced by the computation as explained above.

No wind tunnel test is required by the Department of Commerce with biplane cellules, although the need for it is then much greater. With biplanes, the question of the exact center of pressure of the cellule, of the center of pressure of the individual wings and of the load distribution between these two wings is very complex when it comes to exact numerical values. The interference between the two wings gives rise to effects not directly proportional to the angle of attack, but also to higher powers. The moment curve has a tendency to bend. That makes it hard to follow up with theory. At low angles of attack the ordinary relation between the lift coefficient of the individual wing and its moment coefficient holds fairly well, but not at higher angles. With biplane wings, particularly with the upper one, we can not further rely on the moving back of the center of pressure at the burbling point. Since the conditions beyond the burbling point are not open to computation, we have to rely on model tests for each specific case, and even these model tests are not wholly reliable. Biplanes require, therefore, a larger margin of safety for the load distribution than monoplanes. This is in favor of the monoplanes.

The distribution of the lift occurring over the biplane can at least be understood in a broad way from the general theory. Biplanes with small stagger show travel of the resultant center of pressure similar to monoplanes. Staggered biplanes may have a larger one, depending on the decalage of the two wings, that is on the difference of their angles of attack. With staggered biplanes, the travel of the center of pressure depends not only on the dimensions of the wing sections and on their mutual position, but also on the aspect ratio. The induced downwash likewise exerts some influence on the travel. The rear wing receives downwash effects from the front wing; it is not only located in its own downwash but also in that of the other wing. Its lift is therefore reduced more than the lift of the front wing. This effect is stronger with a small aspect ratio than with a large one. The effect can be computed numerically and shows quite well what to expect from a change of the dimensions.

All this refers to the biplane forces in full numerical detail. Looking at them in a broad way, it can be stated that there is no fundamental difference with respect to the travel of the center of pressure between single wings and biplane wings. The effect on the airplane as a whole is the same in both cases. The aerodynamic center, which is the center of gravity of the air forces coming into existence by an increase of the angle of attack, is at least approximately fixed with biplanes; it does not travel considerably. For preliminary work and for the discussion of general design questions it can be considered fixed.

From the monoplane wing and the biplane cellule we proceed to the combination of all horizontal surfaces contained in an airplane and contributing to the creation of lift. This includes the horizontal tail surfaces. We inquire about the travel of the center of pressure of this entire unit composed of wings and horizontal tail surfaces.

The speed, air density, and setting of the control surfaces are again supposed to be unchanged. The problem can then be similarly treated as the analogous one referring to the wings only, and the answer follows the same lines. The travel is again characterized by a fixed aerodynamic center, approximately fixed at least. This is now the aerodynamic center of the entire airplane. The airplane as a whole likewise has a fixed aerodynamic center, with respect to which the moment coefficient of all air forces is constant. This statement now refers to any number of wings combined in any way, but particularly to a combination of a single wing and its horizontal tail surface. The relation is based on the proportion between a change of the angle of attack and of all air forces set up in all wings by this change. Mutual interference between different wings is not in keeping with this proportion, but then this interference is often small and can be neglected in many cases. The downwash effects are proportional to the angle of attack, and they do not contradict a fixed aerodynamic center. The downwash, however, has a distinct effect on the location of the aerodynamic center, and generally moves it forward. All air forces set up by a change of the angle of attack are proportional to the effective angles of attack, and the rear effective angles are less increased than those at the front because the induced angle of attack is larger in the rear.

To be more specific, we consider now the most important and simplest case, which is a single monoplane wing with its horizontal tail surface. The stabilizer with its elevator creates its downwash like every wing in keeping with the main formula of wing theory. In addition, it is located in the downwash of the wing in front of it. The former downwash may be termed self-induced in order to distinguish it from the latter. The self-induced downwash is computed like the ordinary downwash of a wing, but the wing downwash in the vicinity of the tail has to be computed from the wing force and the wing dimensions.

We saw that the downwash induced by a wing reaches half of its final value at the points of the wing, and increases further behind it. Accordingly it can be expected that the downwash of the wings at the points of the tail is larger than the induced angle of attack of the wing. Theory suggests a multiplication factor between 1 and 2, and closer to 2 than to 1. Wind tunnel tests have shown an average for that downwash factor equal to 1.8, which is in good keeping with theory. At the present state of our knowledge, it is probably exact enough to employ one universal constant downwash factor from wing to tail once for all, and we will assume 1.8 for it.

This enables us to determine the downwash effect on the horizontal tail surface. The tail surface behaves like an ordinary wing, flying in air moving downward under an angle 1.8 times the induced angle of attack of the wing

in front. The latter angle was seen to be equal to  $\pi a_w$ 

so that the downwash angle becomes \_\_\_aw denotes the

wing aspect ratio. The reduction of the lift of the tail surface caused by the wings in front is accordingly larger than the reduction of the wings themselves, which is

 $1 + \frac{2}{1.1a_w}$ 

as discussed in a former article. The reduction of the tail

(Continued on following page)

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(Continued from preceding page)

lift is given by the factor

$$\frac{1}{2 \times 1.8}$$
 $1 + \frac{1}{1.1a_{w}}$ 

which results from the factor written down before by inserting 1.8. The angle of attack of the tail surface thus reduced by the wing downwash is further reduced by the downwash of the tail surface, giving rise to a second reduction

The total reduction factor of the tail surface is the product of the two factors, and is therefore

$$(1+\frac{2}{1.1a_{w}})$$
  $(1+\frac{2}{1.1a_{t}})$ 

Multiply the tail surface by this reduction factor, and the wing area by the reduction factor

The aerodynamic center then divides the line connecting the twenty-four per cent point of the tail surface and the wing in a ratio inverse to the products obtained.

The setting of the wings or the wing section does not occur at all in the computation. Their influence on the aerodynamic center, if any at all, is only secondary. These things influence the equilibrium, but not, as we will take up again later, the stability. The latter is computed from the aerodynamic center alone.

This is the seventeenth of a series of articles by Dr. Max M. Munk. Copyright 1931. All rights reserved by the author.

#### REGULATION OF AERIAL CARRIERS

(Continued from page 27)

being made to extend the control of airlines to the degree that the railroads are regulated by the Interstate Commerce Commission.

The similarity found in the development of legislation governing these two forms of transportation is very striking. The jurisdiction of the Federal Government is based on the same clause of the United States Constitution (Interstate commerce clause, Article 1 Section 8). The initial acts and subsequent legislation have followed parallel courses, the one set of regulations being administered by the Interstate Commerce Commission and the other by the Aeronautics Branch under the Secretary of Commerce.

A further comparison of the development of this legislation will perhaps make for a better understanding of the present situation and afford an indication of what may be expected in the future. First let us look to the Interstate Commerce Commission and the Interstate Commerce Act which as amended applies to common carriers engaged in: The transportation of passengers or property wholly by railroad or partly by railroad and partly by water when both are used under a common control, management or arrangement for a continuous carriage or shipment; or the transportation of oil or other commodity by pipe line, or partly by pipe line and partly by railroad or by water; or the transmission of intelligence by wire or wireless inter-

As defined in Paragraph (3) of Section 1 of the act, the term "common carrier" includes all pipe line companies, telegraph, telephone and cable companies operating by wire or wireless; express companies, sleeping car companies and all persons engaged in such transportation or transmission as common carriers for hire. The term "railroad" includes all bridges, car floats, lighters, and ferries used by or operated in connection with any railroad, switches, spurs, tracks, terminals and terminal facilities, including all freight depots, yards and grounds used or necessary in the transportation or delivery of any such property. The term "transportation" includes locomotives, cars and other vehicles, vessels and all instrumentalities and facilities of shipment or carriage and all services in connection with the receipt, delivery, elevation and transfer in transit, ventilation, refrigeration or icing, storage, and handling of property transported. The term "transmission" includes the transmission of intelligence by means of wire, cable, radio apparatus, or other wire or wireless conductors or appliances and all instrumentalities and facilities for, and services in connection with, the receipt, forwarding and delivery of messages, communications, or other intelligence so transmitted.

The Commission whose general function is the administration and enforcement of the provisions of the act and its subsequent amendments, is an independent body having quasi-legislative and judicial powers. It is directed by the various statutes to provide for the safety of employees, passengers and property; to require the establishment and maintenance of just and reasonable transportation facilities, rates, classifications, regulations and practices; to supervise the issuance of securities or the assumption of financial obligations by the carriers; and to function as a correlating agency between the competitive factors in the transportation industry. The Commission is empowered to do whatever is reasonable and necessary to accomplish the above functions. To summarize these facts the Commission may be considered as a board of directors of the carriers, which for purposes of regulation, are conceived as one great combined system under centralized ownership and control.

It will be seen that railroad transportation is very far advanced into the fourth period in the development of transportation system, which is the stage of Government supervision and control.

It is obvious that the Federal regulation of airlines falls (Continued on following page)



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far short of that applied to the railroads, controlled as they are by this powerful directorate. So far, airline legislation has not reached much beyond the two primary steps,

the fundamental provisions for "promotion" and "safety."

The question which naturally arises is whether airline control is going to run the same gamut as traversed by railroad regulation. Will history repeat itself and will airline regulation be continued to the point now reached by the railroads?

A recent development which is pertinent to these considerations is the report of the Interstate Commerce Commission No. 183000 on Motor Bus and Motor Truck Operation submitted to the House Committee on Interstate and Foreign Commerce. Following this in due course of time, Congressman Parker, in February 1930, introduced a bill (H. R. 10288) "to regulate the transportation of persons

STATEMENT OF OWNERSHIP MANAGEMENT, CIRCULATION. ETC., REQUIRED BY THE ACT OF CONGRESS, AUGUST 24, 1912,

of Aero Dicest, published monthly at New York, N. Y., for October 1, 1931.

State of New York, State of New York,

Before me, a Notary Public in and for the State and county afore-said, personally appeared Frank A. Tichenor, who, having been duly sworn according to the property of his knowledge and belief, a true statement of the ownership, man-agement, etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, embodied in section 411, Postal Laws and Regulations, to writ:

section 41, Fostal Laws and Regulations, to wit:

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2. That the owners are: The Aeronautical Digest Publishing Corp., 220 West 42nd St., New York, N. Y.; Frank A Tichenor, 220 West 42nd St., New York, N. Y.; Jessie H. Tichenor, 220 West 42nd St., New York, N. Y.

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(Signed) FRANK A. TICHENDR.

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Sworn to and subscribed before me this 24th day of September, 1931. (Signed) ANNA HIGGINS.

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in interstate and foreign commerce by motor carriers operating on the public highways" with provisions for the Interstate Commerce Commission to administer its purposes. The House passed this bill but it failed in the Senate Chamber. It is understood that an attempt will be made to put this legislation through during the next session of Congress, and its passage or non-passage will be an addition to our sum-total of facts on this question and its relation to the air transport problem.

Incidentally, the report of the Commission mentioned in the foregoing paragraph contains in its conclusion (Par.

26) the following statement:

'As far as practicable there should be a definite coordination of all existing transportation agencies on land, water and air."

Primarily, of course this report concerns buses but this statement gives an intimation of what may be in store for the operators of interstate passenger airlines at some future

The airline situation may resolve itself into the same arrangement now existent in the radio field. The Interstate Commerce Commission has jurisdiction over the transmission of intelligence by wire, wireless, radio, etc., while the Federal Radio Commission serves as an agency for the issuance of radio licenses and the allocation of frequencies to bring about clearer and better transmission and reception. If the Interstate Commerce Commission is given control of the airlines the functions of licensing airmen, aircraft and equipment and the duties of encouraging and promoting aeronautics would presumably remain in the Aeronautics Branch of the Department of Commerce.

Expressions of dissatisfaction have been heard in various quarters concerning the administration of the provisions of the Watres Act for the carriage of air mail and payment therefor. To these concerns and individuals it may be interesting to observe the arrangements now in effect with

regard to the railroads.

The Post Office Department appropriation acts of August 24, 1912, and July 28, 1916, together with the act dated July 2, 1918, empower and direct the Interstate Commerce Commission "to fix and determine from time to time the fair and reasonable rates and compensation for the transportation of such mail matter by railroad common carriers and the service connected therewith, prescribing the method or methods by weight, or space, or both, or otherwise, for ascertaining such rate or compensation, and to publish the same, and orders so made and published shall continue in force until changed by the Commission after due notice and hearing." These rates have been determined by the Commission through a thorough study and investigation of the costs of the mail services performed by the railroads to-

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gether with due consideration for any other factors involved.

If jurisdiction over the airlines is given to the I. C. C. and similar provisions for the transportation of air mail are enacted, the far-reaching effect can be visualized by all who are familiar with the present air mail situation.

It is impossible to draw any definite conclusions at this time with regard to the future fate of interestate air transport operators but the relation of the airlines to the rail-roads is practically the same as the bus lines at the present time. A great number of buses are owned and operated by railway companies both in intrastate and interstate traffic and likewise certain rail companies have acquired interests in airline routes. These points of similarity, coupled with the greater interstate character of air transportation, may fairly lead us to believe that whatever action is finally decided upon regarding the buses, will also be the ultimate fate of the airlines.

The problem presented by State regulation of airlines is demanding considerable attention throughout the country, especially as far as interstate operators are concerned.

Same state governments, through their Corporation Commissions or similar bodies require "certificates of necessity and convenience" before common carriers by air can operate between two or more points within the state boundaries. This applies both to intrastate and interstate activities if service is to be maintained between two or more cities. Undoubtedly this form of control by the states has been beneficial in cases involving local or intrastate projects where the purpose is to protect the infant air transport business from the blight of ruinous competition. Such decisions have been rendered by the Public Service Commissions of Pennsylvania and Nevada.

The requirement of these certificates for interstate operators who touch in two or more points in a state is a question far more complex in its make-up. We cannot forget the strongly interstate character of air navigation and its essential nature seems to dictate that it be regulated by national rather than state authority. An extreme case, for example, shows some of the difficulties. Suppose two transcontinental lines passing through as many as ten or eleven states were required to obtain certificates of necessity and convenience in each state where more than one stop was scheduled; also presume that the two lines came together within the borders of one state due to geographical features or for other reasons and followed the same route between two cities. Would the state corporation commission grant one certificate and refuse the other on the grounds that the route was already served by one airline, even though this might be the only section on the entire crosscontinent line which duplicated the service of another operator? Granting that there would be no difficulties encountered in securing the necessary certificates to operate, the formalities and trouble of submitting petitions and the accompanying expense and time involved would probably be sufficient to raise the question as to whether these state requirements were burdens on interstate commerce. It such provisions by state authorities are to be considered as interferences or burdens, impeding free traffic between the several states, the case is immediately clarified in favor of sole national control since this question has been decided by the Supreme Court in various notable decisions. Until an issue is made of this question and the constitutionality of state requirements as applied to interstate operators is de
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FOR SALE: One Irving chute, complete, silk, never jumped; in A-1 condition. First \$150 takes it. \$25 deposit with order. John H. Beahm, Lynchburg Virginia.

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LICENSED A & E man, 10 years experience on aircraft, recently back from South American expedition, desires position with reliable company, preferably assistant to manager or sales. Can go anywhere. M. Distel, Babylon, New York.

RADIO OPERATOR and Navigator. Successful record, military and commercial Formerly sutraction and commercial formerly supanish. Desire opportunity with individual or ford, New Jersey.

YOUNG MAN, 19, trained in airplane and engine mechanics, also welding, wishes starting position in industry. Vincent Alekna, 27 W. 18th St., Chicago, Illinois.

TRANSPORT PILOT: Graduate Royal Flying Academy. Cross country barnstorming experience. Monocoach, Robin, Monocoupe, b'plane time. Clean record. Have own ship. Will go anywhere; age 22. Clary Vauk, Route No. 3, Madison, Wisconsin.

YOUNG MAN: single, wants position connected with aviation. Office experience; handy at almost anything. Write AERO DIGEST, Box 1228.

TRANSPORT PILOT: Experienced on open and closed ships including Fords; night flying; student instruction. Salary secondary, Go anywhere, T. T. Kincheloe, 201 W. 11th St., New York City, N. Y.

TRANSPORT PILOT: 306 hours; experienced as co-pilot on line, barnstorming and instruction. Instructed in South America. Consider any proposition. Excellent references. AERO DIGEST, Box

#### WANTED-PLANES, SITES, EQUIPMENT, ETC.

WANTED: J5 Waco, either straight or taper wing job, preferably less motor. Wil. pay cash, must be bargain. Write or wire. Glen W. Fellows, 1406 Union & Peoples National Bank Bldg., Jackson, Michigan.

WANTED: Used two or three place plane, Either OX or radial. Must be licensed and cheap for cash. C. W. Howell, New Milford, Penna.

WANTED: Used Aeroncas, all models. Write full details. J. A. Hannigan, 101 W. Roosevelt Blvd., Philadelphia, Penna.

WANTED: A three-place open plane, Kinner or warner engine. State condition and lowest cash price in first letter. Write F. H., 12139 Kilborne St., Detroit, Michigan.

WANTED: Js or radial job, flying condition cracked, needing repairs. Will trade OXS Travel Air and cash. Roger Mensing, 1218 Jones St., Ft. Wayne, Indians.

WANTED: Responsible party wishes to lease and personally operate airport or flying field. Give full details and lease price. AERO DIGEST, Box

\$2,000 CASH for the best airplane I can buy; open or closed job, for private owner. Give full details in first letter. AERO DIGEST, Box 1234.

WANTED: LAKES TRAINER and Wace F with Warner. Prefer metal prop and Heywood. Lakes must have American Cirrus; prefer inverted engine. Both planes must be in Al shape and cheap for cash. Paul T. Miller, 1316 Kanawha St., Charleston, West Virginia.

WANT LIGHT MONOPLANE: Preferably low wing monoplane. \$750 cash maximum. Fast cruising essential; fast landing unobjectionable. Will consider good unfinished experimental. Lt. Price, Kelly Field, Texas.

#### MISCELLANEOUS

WINTER STORAGE at low rates with special arrangements to enable you to do work on your own airplane. Opportunity for low cost repairs. Telephone 'Keyport 127'. Wm. L. Dill, Receiver for Aeromarine Klemm Corporation, Keyport, New Jersey.

Have frame store building, located in Indiana. Suitable for any kind of business. Steam heat. Free and c.ear. Will trade for licensed airplane. W. Stewart, 159 W. Bridge St., Oswego, N. Y.

STOCK of Wright J-4B, J-5, Velie and OX-5 motor parts, and other stockroom supplies; also four Wright J-4B motors. Company discontinued operations. Bargain opportunity. Write Stratton Coyner, 1201 Reynolds Building, Winston-Salem, North Carolina.

SEND NAME and address for free bundle of Balsa and price list. Aero Shop, 3050 Hurlbut Avenue, Detroit, Michigan.

FAIRCHILD MONOPLANE and Lockheed Sirius drawing and our new catalog; all for only 10%. Brooklyn Model Aircraft Co., 1326 Flatbush Ave., Dept. 11, Brooklyn, N. Y.

AGENTS: Mechanics Soap, cleans greasy hands immediately. Dozen cans \$1.50. Mechanics Soap Co., 1610 Knapp, St. Louis.

MAGNETOS, ALTIMETERS, TACHOMETERS— For expert repair and testing of any instruments or electrical apparatus, send them to Streed Elec. Co., 1312 Harmon Place, Minneapolis, Minnesota'

WILL TRADE quarter unimproved land worth \$1500 for light plane; give full particulars in first letter. J. C. Fenno, Edgeley, North Dakota.

WHO HAS a 2 or 3 place ship to trade for 1929 Oldsmobile DeLuxe Coach, in excellent condition? Address Box 12, Cedar Rapids, Iowa.

1000 BUSINESS-LIKE Airplane builders and buyers names, Conscientiously compiled from our latest business correspondence, Never before solicited. First time offered. \$\$ postpaid. Aerobuilders Advertising Service, 1305-15 So. 12th, Linco'n, Nebraska.

LATEST MODEL STINSON Junior as seaplane or landplane, with transport pilot, open to winter proposition in south. Write AERO DIGEST, Box 1226.

#### FOR SALE

WARNER-POWERED Fleet seaplane, Edo floats, Standard prop, water ruiders; DeLuxe type, N.C. license, full set of instruments, like new, a wentlense, full set of instruments, like new, a wentlense type improvements, like new, stop of the better, 3390. Travel Air 168 seaplane, N.C., like new, 8290. Eclipse hand inertia starters, 590. Key Follmer are camera, complete with vertical very started and the starters, 500. Travel Air 168 seaplane, N.C., like new, 8290. Eclipse hand inertia starters, 590. Follmer are camera, complete with vertical very source, 1500. Veile 55 hp. with Hartzel brop, 30 mostly, part of motor, puber and tractor, magnetos for all of motor, puber and tractor, magnetos for all as represented. Frank Mills, Essington, Pennsylvania.

FOR SALE: New inverted in-line Argus engine, four cylinder, air cooled, 89 H.P., 1939 model ASS. The foremost European light engine. Brand new in crate, \$750. Menasco Motors, Inc., 6718 McKinley Avenue, Los Angeles, California.

CURTISS MOTORS: We have cut the price of our OXS and OXX motors from \$15 to \$85 to move them quickly. These motors are rebuilt like new and we have used hundreds for marine motors for boats. Will send full information to interested parties. Grant Marine Motor Co., 827 Whitter Blud, Detroit, Michigan.

ONE ANZANI 45 H.P. six cylinder radial motor with propeller and cap. 170 lbs., perfect condition, \$160. \$30 deposit with order. John H. Beahm, Lynchburg, Virginia.

BARGAINS: Brand new OXS, \$198.59; Szekely, used if sheurs, \$295; Wright J4, complete, \$195. Paragon Cirus props, \$137.5 cach. Steel aircraft paragon Cirus props, \$10.75; cach. Steel aircraft Switches, oil gauges, etc. 37c. cach. Acetate dope, 58c gal. 38. x4" Goodrich tires, \$225 sech. 28. x4" Goodrich tires, \$225 sech. 28. x4" Goodrich tires, \$225 sech. 28. x4" Condition to the complex sech. 28. x4" Goodrich tires, \$225 sech. 28. x4" Condition to the complex sech. 28. x4" Goodrich tires, \$225 sech. 28. x4" Condition to the complex sech. 28. x4" Goodrich tires, \$225 sec

FOR SALE: New OX5 motor complete, not rebuilt, \$150 cash. Wikle Airways, Marianna, Florida.

JUST PLANE PHOTOS: Xmas offer. Hundred seals, \$1. Fifty  $2\frac{1}{2} \times 4\frac{1}{4}$  photos, \$1. Ten 8 x 4, \$1. Four 10 x 7, \$1. New catalog. John Stiles, Stoughton, Mass.

BARGAINS in motors, propellers and hubs for your lightplane, ice-boat or snow-sled. Converted Harleys and Indians, SS to \$59. Fords and Chevrolets, \$59 to \$125. Anzanis \$175 to \$255. Forpellers, \$5 to \$14. Hubs, \$5. New Flying Flivers, \$359 up. Blueprints, \$5. Circulars, 16c. Storms Aviation Co. Spartaburg, South Carolina.

FOR SALE: Collection aircraft photos, domestic and foreign, 120 in all, 90 types, 9 x 7 and smaller, 97.59. Also 13 books, every phase of aeronautics, perfect condition, retail \$50, price \$15. Particulars on request. Fred C. Buse, 683 E. 138th St., Bronx, New York, N. Y.

MOTOR: Wright Whirlwind, 150 H.P. Brand new, never taken from shipping box. No reasonable offer refused. Aeronautical Corporation of America, Lunken Airport, Cincinnati, Ohio. AERO DIGEST

TRAVEL AIR, WACO, Parts and Covers. Wings uncovered: Travel Air lower, \$129; Waco, \$129; Travel Air upper, \$145; Waco, \$110. Roger Mensing, 1218 Jones St., Ft. Wayne, Indiana.

OX5 AMFRICAN EAGLE: complete, less lower wings, \$250 or what? 3 place Swallow landing gear. Unused Irvin 'chute. Guaranteed rebuilt OX5, \$50. AERO DIGEST, Box 129.

FOR SALE: New 120 b.p. Super Rhone radial motor, \$125; also high lift wing, 30-foot span, uncovered, with 40 gallon gas tank, \$50. AERO DIGEST, Box 1230.

#### PATENTS

INVENTOR'S UNIVERSAL EDUCATOR. Contains 900 mechanical movements; 50 perpetual motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests Price \$1.00 postpadi in U. S. A. Address Dieterich Co., 602-C, Ouray Building, Washington, D. C.

#### HELP WANTED

WANTED: Pilots to organize flying groups in every state. Apply American Flyers Assn., Suite 220 Durley Bldg., Bloomington, Illinois.

#### ECONOMICAL ADVERTISING

LA CROSSE INSURANCE AGENCY, Inc. 328 Pearl St., La Crosse, Wis.

October 12, 1931

AERO DIGEST, 220 West 42nd St., N. Y. C.

GREAT LAKES TRAINER: American Cirrus, privately owned and always kept in hangar. Never cracked. Motor recently overhauled and inspected: 245 hours. \$1,200. W. F. Hurtgen, 328 Pearl Str., La Crosse, Wisconsin.

Gentlemer

Wish to say that the above advertisement which appeared in your September and October issues has resulted in 47 inquiries from all over the country, and on October 9th the ship was sold for cash.

The above results are conclusive proof that advertising in AERO DIGEST really pays dividends in spite of the fact of nation-wide depression. The total cost of my two ads was \$5.20, and I wish again to state that advertising in your periodical pays, as it reaches all those who are interested in flying.

I have not as yet received my October issue of AERO DIGEST, but presume it will be here any day. I want to thank you for your co-operation in enabling me to sell my plane.

Yours very truly, (Signed) WM. F. HURTGEN, TWO classified advertisements in AERO DIGEST sold Mr. Hurtgen's Great Lakes Trainer for less than one-half of one per cent of its selling price.

=

If you have a plane, engine, parts — anything aeronautical, in fact—that you want to sell quickly and at little cost, try a classified advertisement in the next issue of AERO DIGEST.

The rate is low—10c a word, \$2.50 minimum. Forms for December classified advertising close November 24th.

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American Airplane & Engine Corp.
Bernard Aircraft Company
Bird Aircraft Company
Bird Aircraft Company
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Rearwin Airplanes, Incorporated
Stearman Aircraft Company
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Waco Aircraft Company

#### AIRCRAFT JOBBERS

Crawford Airplane Supply Company Nicholas-Beazley Airplane Co., Inc. Pacific Airmotive Corporation, Ltd.

#### AIRPORT DRAINAGE

Gohi Culvert Manufacturers, Inc.

#### BOOKS

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California Press
Ronald Press Company
Stark, H. C.
Aero Digest Book Department

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(See also Aircraft Jobbers)

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Govro-Nelson Company
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Scintilla Magneto Company
U. S. Hammered Piston Ring Co.
U. S. Magneto Company
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Wittek Manufacturing Company

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Munk, Dr. Max M.

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#### GLIDERS

Mead Gliders

#### HANGARS

Butler Manufacturing Company

#### HOTELS

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Horizon Company, The

#### LICENSING ORGANIZATION

Autogiro Company of America

#### OIL AND GASOLINE

Kendall Refining Company Stanavo Specification Board Standard Oil Company of New York Texas Company, The Vacuum Oil Company

# PAINTS—VARNISHES DOPES — LACQUERS

Berry Brothers, Inc.
Phenix Aircraft Products Company
Titanine, Inc.

#### **PARACHUTES**

Irving Air Chute Company, Inc. Switlik Parachute & Equipment Co.

#### PARTS AND MATERIALS

(See also Aircraft Jobbers)

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#### PATENT ATTORNEY

Polachek, Z. H.

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Pilot-Plane Photos

#### PLYWOOD

Yoho & Hooker Lumber Company

Aero Brokerage Service Company

American School of Welding

#### RADIO

Western Electric Company

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#### SPARK PLUGS

A C Spark Plug Company
B. G. Corporation
Champion Spark Plug Company

#### TELETYPE SYSTEM

American Telephone & Telegraph Co.

#### TIRES

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# BERRYLOID FINISHES

#### WIN PRAISE FOR KEYSTONE

■ Keystone Aircraft Corporation, through its president, Edgar N. Gott, voices the opinion of the oviation industry in the letter reproduced above. All Keystone airplanes for both the army and navy are finished 100% with Berryloid. The following Berryloid finishes are used: pigmented and semi-pigmented dopes, clear nitrate dope, red oxide primer, aircraft enamel reducer, anti-blush reducer, aircraft spar varnish and other specialties meeting army and navy specifications.

Berry Brothers has worked with the aviation industry from the early days, constantly developing new finishes and finishing methods to meet airplane needs. Let our aviation division help you with any problems in the finishing of aircraft.



KEYSTONE AIRCRAFT CORPORATION

BRISTOL PA

September 16, 1931

Berry Brothers, Inc., 211 Leib Street, Detroit, Michigan.

Centlemen.

We congratulate you on your untiring efforts to improve Berry Brothers' airoraft finishes. During the past few years in which we have used marked improvement in the finished appearance of our airplanes and flying boats. We have been complicented samy times on the excellent finish of our oraft.

Another thing we are grateful to you for is the close cooperation and service so generously given by your Sales and Service Departments.

We extend to you our heartiest best wishes.

Very truly yours,
KEYSTONE ATROPOST CONFORMATION

CALLED TO COUNTY

EARLY COUNTY

Fres in County

ENG: B



## BERRY BROTHERS

DETROIT, MICHIGAN

WALKERVILLE, ONTARIO

MANUFACTURER OF PROGRESSIVE AIRCRAFT FINISHES
MEMBER AERONAUTICAL CHAMBER OF COMMERCE



stand up!

Mobiloil Aero Oils are sold the world over. They have to stand up.

Not only in America, but over Europe, Asia, Africa and Australia Mobiloil Aero Oils encounter the greatest extremes of heat and cold, ong distance operation, high speed and severe load conditions in continuous daily service.

Across the Sahara, across the Andes, across the Great Lakes—Mobiloil Acro Oils must stand up. Stand up quality must be built into them to fight the extremes of cold and every degree of heat and wear.

Because they stand up these oils

give you the "double-range" protection of easy starting at low temperatures—and full, rich lubricating quality for high speed, heavy load flying.

Mobiloil Aero Oils are on sale at major airports throughout the world. Try them and find out what "stands up" means in your engine.

Mobiloil AERO stand up VACUUM OIL COMPANY, Inc.

FOR ROCKER-ARM LUBRICATION USE MOBILGREASE

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AVIATION ENGINE STARTERS and GENERATORS

# bear thestamp of approval

Use on nearly all transport lines in America to a tribute to the performance demanded and received from Eclipse equipment.



Eclipse type E1 starter for engine paper to 1350 cubic imposton displacement.



Eclipse, Series Combination Hand and Electric Inc in Starter with Solemond Switch. Concerning type for radial engines up to 1350 c





Eclipse voltage-regulated generator, 15 volt, 25 ampere capacity, engine drive type with control box.



Eclipse type M-B double voltage, voltageregulated radio generator engine driven.



ase direct cranking electric starter, 150, for engines up to 450 cu.



Eclipse, Series 11, Hand Inertia Starter, concentric type for engines up to 2500 cu. in. piston displacement.

#### ECLIPSE AVIATION CORPORATION

East Orange, New Jersey
(Subsidiary of Bendix Aviation Corporation)



Eclipse direct crap pectric starter, type F-141, for company to 800 cu.



Eclipse, Series 7, Combinate and Electric Inertia Starter word Solenoid Switch. Vertical type for type or radial engine up to 2500 cu. in. piston displacement.



Eclipse aviation dynamotor type "A")

December, 1931

35 CENTS

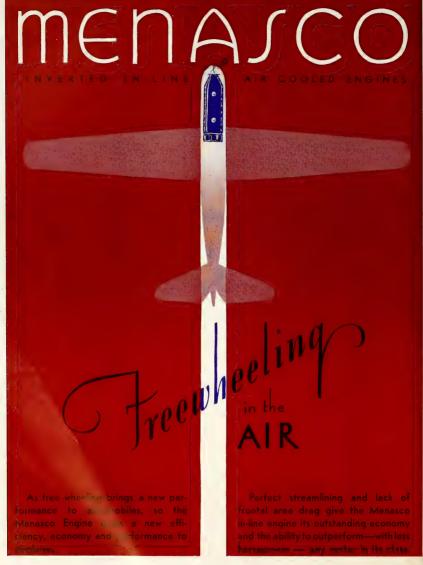
# AFRO DIGEST



General Fechet Joins Aero Digest Foreign Planes 

Ocean Flights

History of the Airplane Catapult



MENASCO MOTORS, INC. + 6718 McKinley Ave., Los Angeles, Cal.

AIRPORTS, AIRLINES, FLYING SCHOOLS, DEALERS: Lend a real aeronautical tone to your offices and waiting rooms. Use these airplane chairs. They are appropriate, comfortable and inexpensive. They are built to last!

# AIRPLANE CHAIRS

\$5.95

JUST bought 117 real airplane chairs. Cost the factory \$15 each in 500 lots. Made by Heywood-Wakefield, famous reed furniture manufacturers. Worth \$25 retail at least. Got them dirt cheap! Now you can buy these airplane chairs for only \$5.95 each.

#### HERE'S WHAT THEY ARE

Light — Strong — Durable — Comfortable (very comfortable) — Distinctive — Even Beautiful!

Unless I miss my guess, these few chairs will not last long. That is why you ought to send your order right now.

USE: THEM

— on the Porch — in the Office — at the Bungalow

— in your Den — on the Yacht

If you buy aeronautical materials, supplies or articles like airplane piston ash trays, airplane piston book ends, ornamental propellers, etc., a dime sent me with the coupon filled out with your name and address will secure for you my latest catalog and will be the best investment you ever made.



Remember, there are only 117 left and they are exactly like the illustration above. You can have your chair finished in green, old ivory or orange red, or unfinished, if you desire to paint it yourself. These splendid, distinctive and useful chairs are being offered at approximately one-quarter of their real value. Use the coupon below and get your order in while all colors are still available. (No charge for packing or crating.)

| PIN YOUR ORDER OR DOLLAR BILLS TO THIS COUPON.            |
|-----------------------------------------------------------|
| 628 W. Poplar St.,                                        |
| York, Pa.                                                 |
| Dear Ort: I sure would like to have some of your airplane |
| chairs. Enclosed find \$ for which please express         |
| to me right awaychairs as checked.                        |
|                                                           |
| First ChoiceSecond Choice                                 |
| Third Choice                                              |
| Name                                                      |
| Street                                                    |
| City State                                                |
|                                                           |

Good JUDGMENT

# when you know good LIFE is at stake

—is to be prepared to safe-guard it. And, if necessary, to save it. In the air, good judgment says, "Be prepared with parachutes".

You may never need one but if you do-you WANT it!

So in making your purchase of a parachute, you will realize that here is a life-or-death proposition. That only the best is good enough. That it is highly technical equipment in which the one thing you can be sure of is a record of success. Here you want to be positive. But one may ask—

By what will you judge? ACTUAL LIVES SAVED, will be your best measuring stick. By this proven standard, one name stands pre-eminent. In every flying country on the earth, in the lives of the world's greatest air men and women, you hear this said in gratitude, "An Irvin Air Chute saved my life".

It's good judgment to take an IRVIN with you. Exercise this good judgment now-

More Than

500

Lives Saved

IRVING AIR CHUTE CO., Inc.

372 Pearl St., Buffalo, N. Y.

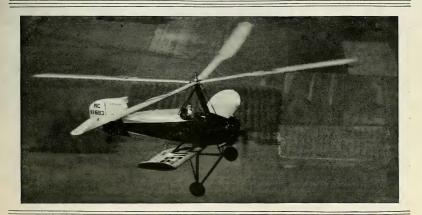
West Coast Factory and Office: 1500 Flower Street, Glendale, Calif. Canadian Factory: Bridgeburg, Ont.

CHUTES "The Life-Preserver of the Air"



DECEMBER, 1931

# The AUTOGIRO is not an airplane



KELLETT AUTOGIRO BUILT BY KELLETT AIRCRAFT CORPORATION, PHILADELPHIA

To appreciate the fundamental distinction between the airplane and the Autogiro it is necessary first to understand the essential theory of flight of any heavier-than-air craft.

This can be condensed into a comparatively simple statement.

Air is a fluid, but of such thin consistency that, when still, it cannot support even the lightest feather.

However, move air rapidly or move an object rapidly through it, and air becomes "resistant" and affords "support."

Stripped of technical details, that is why all heavier-than-air craft can only be sustained in flight by rapid movement of their lifting surfaces through the air. Since the airplane's lifting surface (fixed wings) are a fixed part of the machine itself, their movement through the air is solely dependent upon the fast forward speed of the entire machine.

On the other hand, the speed of the fast moving lifting surfaces of the Autogiro (its rotor blades) is independent of the speed of the craft itself. Therefore the Autogiro is capable of sustained flight with very little forward speed of the machine as a whole.

To this one all-important difference is traceable all the Autogiro's distinctive characteristics, including its immunity

to spins and other critical situations, its ease of control and maneuverability.

In addition, the Autogiro rotor has no connection with the engine while the Autogiro is in flight. The rotational speed of its blades is practically constant whether the Autogiro is traveling fast or slow, hovering, or descending with little or no forward speed. It is not affected even by motor failure.

Such an aircraft largely eliminates the restrictions and hazards of learning to fly and opens the way to a wider use and enjoyment of flying by everyone.

The Autogiro Company of America is an engineering and licensing organization. It owns and controls, exclusively, all Autogiro patent rights in the United States. Manufacturing companies of high standing will be licensed to build Autogiros with the full cooperation of our engineering staff

Present licensees are: Buhl Aircraft Company, Detroit, Mich. . . . Kellett Aircraft Corp., Philadelphia, Pa. . . . . Pitcairn Aircraft, Inc., Willow Grove, Pa.



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in brand new "Juniors"

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THE Rearwin Flying School offers expert flight training in brand new "Juniors" at the low rate of only \$10 an hour dual. Experienced transport pilots who are experienced also in student instruction take a personal interest in your progress. Their individual attention is part of the course.

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HE Rearwin "Junior" made its bow to the aircraft marker early in 1931, in the face of stiff competition. Its popularity among flying schools and private fliers has grown rapidly in a comparatively short time. 

Backed by the personnel and organization which produced the performing "Ken-Royce" and supported by the policy that the basis of sound competition is quality and not and supported by the pointy that the basis of solute competition is quarty and not price—the "Junior" was destined at the very start to occupy a prominent place in the light plane field. ¶ The Rearwin "Junior" has an adjustable stabilizer which can be operated from either seat, dual controls, sufficient gas capacity for cross country flying without frequent landings for refueling, wide landing gear with air wheels and shock absorbers, center section which lends itself to a winter enclosure, front and rear individual windshields, large roomy seats and plenty of leg room for large individuals in the six foot class. The beautiful new 1932 Rearwin "Junior" models are ready for delivery with the Szekely SR-3-0 45 h.p. or the Aeromarine AR-3 50 h.p. engine. In the very near future a detachable winter enclosure will be available as optional equipment. 

We are proud of the progress which our conscientious efforts have given to the Rearwin "Junior" during 1931. Watch where it goes in 1932-you will not be satisfied with owning anything less than a "Junior" if you are thinking of buying a training or sport plane.

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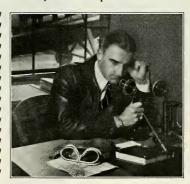
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DECEMBER, 1931



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9

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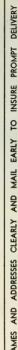
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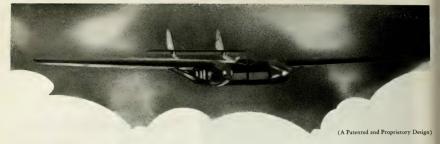
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The new High Speed Burnelli—with its lifting fuselage of limousine cabin arrangement, retractable landing gear in the fuselage and consistent aerodynamic refinements throughout—provides the immediate means for substantial earnings on a higher scale.

The twin-engine installation of the Burnelli Transport combines—with available engines the necessary size increase and power reliability of the multi-engined airplane with the higher acetodynamic efficiency of the finest single-engined designs, together with other superior structural and safety features. The aerodynamic advancement as set forth above is explained in the following extracts from a wind tunnel research report of the Guggenheim School of Aeronautics, New York University:

(1) The use of airfoil shaped body, while providing large internal space, contributes substantially to the lift. (2) The body being of airfoil form has a very low drag coefficient. (3) The high wing monoplane gives the most efficient wing and body combination. (4) The design allows for retraction of the landing gear together with a high wing and body combination. (5) The design permits the use of twin engine installation without penalty in additional frontal area.

All metal construction and flat skin covering, the choice of air or liquid cooled engines, are other advantages of the Burnelli Type which we shall be pleased to discuss with interested individuals or organizations.

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| Span 70 ft.       | Gasoline                              |
|-------------------|---------------------------------------|
| Horsepower1250    | Oil190 lb                             |
| Fuel capacity     | Number of passengers10 (2,000 lbs     |
| Gross weight      | Mail and Express1,000 1b              |
| Weight empty      | High Speed                            |
| Payload3,000 lbs. | Cruising Speed with 2/3 power175 m.p. |
| Crew340 lbs.      | Stalling Speed                        |
| Climb (retracted) | 1,450 ft. per min.                    |

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10 PASSENGERS

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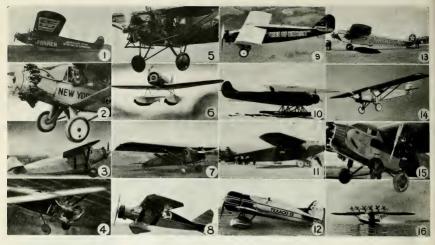
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| 7          |                                                                      |             |    |            |                                       |



1. Commander R. E. Byrd and crew: North Pole flight, May 1926. Fokker "Josephine Ford," 3 Wright Whirlwinds.

Panne Ford, a Wight Maniwhas.

2. Clarene Chamberlin and Charles Levine: Non-stop New York to Germany, June 4-5, 1927. Bellanca "Columbia," Wright Whirlwind engine. 3,911 miles.

3. Art Goebel and W. V. Davis, Dole Prize winners: California to Hawaii, August 16-17, 1927. Travel Air "Woolaroc," Wright Whirlwind engine.

 Hunter Brothers: Refueling endurance record, 553 hours, 41 minutes. Stinson "City of Chicago," Wright Whirlwind engine.

5. Jackson and O'Brine: Second refueling record of 647 hours, 29 minutes. Curtiss-Wright Robin "Greater St. Louis Robin," C-W Challenger engine.

6. Charles A. Lindbergh and wife: Washington, D. C., to Japan, July and August, 1931. Lockheed "Sirius," Cyclone engine. 7,132 miles.

7. Jackson and O'Brine: Refueling endurance record of 420 hours, 21 minutes. Curtiss-Wright Robin "St. Louis Robin," C-W Challenger engine.

8. Boardman and Polando: Non-stop New York to Turkey, July 28-30, 1931. Bellanca "Cape Cod," Wright Whirlwind engine. 5,014 miles in 49 hours, 20 minutes.

5.00 mics in whours, a ministry of the Japan, August Z. September 14, 1927. Stimenging, August Z. September 14, 1927. Stimenging, 12,295 miles in 145½ flying hours.

10. Amelia Earhart with Gordon and Stultz: Newfoundland to Wales, June 12, 1928. Fokker seaplane "Friendship," 3 Wright Whirlwinds. 20 hours, 40 minutes.

 Maitland and Hegenberger: Non-stop California to Hawaii, June 28-29, 1927.
 Fokker, 3 Wright Whirlwinds. 2,400 miles in 25 hours, 50 minutes.

12. Frank Hawks: More than 31 speed records during 1929-30-31. Travel Air "Mystery S," Wright Whirlwind engine.

13. Commander R. E. Byrd and crew: Non-ston New York to Fenne Inne 28-10.

"Mystery S," Wright Whirlwind engine.

13. Commander R. E. Byrd and crew.
Non-stop New York to France, June 28-30,
1927. Fokker "America," 3 Wright Whirlwind engines. 3,477 miles in 41 hours, 27 minutes.

minutes:

A. Lindburgh: Non-ston New
Acrok to Faris, May 30-1, 1927. Ryan
monoplane "Spirit of St. Louis," Wright
Whirlwind engine. 3,610 miles in 33/5 hours.

15. Admiral R. E. Byrd and crew: South
Pole flight, November 28-5, 1929. Ford.

2 Wright Whirlwinds, 1 Wright Cyclone.

18. Dornier DO. X; Germany to New Yock
November 1930-August 1931. 12 CurtissWright Conquere engines. 12,000 miles.

# SUCCESS

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HESE sixteen airplanes, among others, have written fame into the annals of aviation—fame for their pilots and crews and prominence for their manufacturers and for the manufacturers of the engines with which they were powered. But more than that, they have advanced the art of flying and the progress of aviation to a point beyond calculation.

U. S. Aviation Brand Piston Rings participated in each of these flights. With the aviation industry, we express our deep appreciation to these fliers for their courage, skill and experience—for the good which their successes have brought to aviation.

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I NCLUDED in our assortment of plans and photographs is the famous Gee Bee Super Sportster which Lowell Bayles flew to victory in the Thompson Trophy Race at Cleveland in September. You may now obtain black and white photos of this plane for 50c, or colored prints for only 75c. Special Model Builders' Blueprints of the Thompson Trophy

Winner have been reduced from \$1.50 to \$1.00. Photographs of the other Gee Bee models listed below are 50c. Blueprints are 75c. When ordering please be sure to specify the type plane for which you want photos or blueprints. When ordering photographs, please indicate whether you want front, rear, side, ¾ front or ¼ rear views.

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3 view drawing

3 view drawing

No drawing

3 view drawing

### PHOTOGRAPHS

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rear

side, 34 rear, front, 34 front





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DECEMBER, 1931 , 21



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# THE LION'S SHARE ...AND KENDALL

John Livingston, President of the Mid-West Airways Corporation, and his Monocoupe No. 14.

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Event # 6 - Men's 510 Cu. In. A.T. C. Race... First Place
Event # 7 - Men's 650 Cu. In. Free for All... First Place
Event # 8 - Men's 650 Cu. In. Free for All... For One
Event # 8 - Men's 650 Cu. In. Free for All... Scoond Place
Event # 10 - Men's 800 Cu. In. A.T. C. Race... First Place
Event # 10 - Men's 800 Cu. In. Free for All... Fifth Place
Event # 12 - Men's 1000 Cu. In. Free for All... Fifth Place
Event # 12 - Men's 1000 Cu. In. A.T. C. Race... Second Place
Event # 14 - Men's 1200 Cu. In. A.T. C. Race... First Place
Event # 14 - Men's 1200 Cu. In. A.T. C. Race... First Place

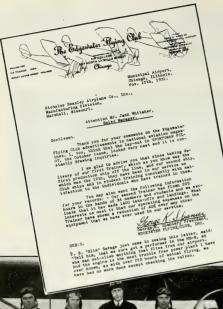


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Wasp-powered pursuit planes for the U.S. Army Air Corps, and Randolph Field administration building, San Antonio, Texas, "The West Point of the Air." (Photo has Caman amvilla)

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AERO DIGEST



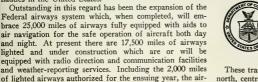
The American Aeronautical Corporation's amphibion of stainless steel in flight at Port Washington, Long Island, New York. (See story on page 60 of this issue).

# ACTIVITIES OF THE **AERONAUTICS BRANCH** Department of Commerce

THE work of the Aeronautics Branch during the fiscal year ended June 30, 1931, has been directed, as in the past, toward the further development of the aircraft industry and the further promotion of civil aeronautics in the United States.

Hon. Clarence M. Young

Assistant Secretary of Commerce



way program now embraces 19,500 miles. However, the 2,000 miles authorized for the fiscal year 1932 have not yet been allocated, but steps in this direction will soon be taken, and during the year this mileage will become part

of the Federal airways system.

In addition to the foregoing, there are 1,123 miles of airways which have been or are being provided with certain air navigation facilities for day operations. Portions of this mileage will be lighted during the ensuing fiscal year, and it is possible that some sections will be utilized to bring about minor relocations of airways which experience has indicated will become necessary to better serve the Federal system.

At present there are 48 airways radio-communication stations in operation for the broadcast of weather information to planes in flight at frequent intervals, an increase of 13 over last year, and 10 stations are under construction. Fifty-one radio range beacons are in operation to provide directional guidance by means of radio signals to airmen flying along the airways, an increase of 42 over the previous fiscal year. There are 13 radio beacons under construction.

At the end of the fiscal year 9,500 miles of automatic telegraph-typewriter circuits for the collection and transmission of weather reports along the airways were in operation, an increase of 3,850 miles over the preceding fiscal

Three lighted transcontinental routes are included in the Federal airways program: one, between New York and San Francisco (in operation on day and night schedules); a second, the midcontinental, between New York and Los Angeles; and the third, between New York and San Diego, known as the southern transcontinental. The latter two have been under construction and are rapidly nearing completion. Air transport companies now are operating passenger, mail, and express services over these three routes.





These transcontinental airways are designed to serve the north, central, and southern sections of the United States from east to west both directly and through feeder routes and connecting routes. Also they not only constitute the basis for air transportation service to a large portion of the country, but at the same time they provide alternate routes for air travel. Further, they are coordinated closely with various border countries and are so designed as to facilitate international travel to the nations of the Western Hemisphere.

#### Research Work

Of immediate and potiential value to aeronautics in general is the research work undertaken by the Aeronautics Branch during the fiscal year just closed. Much of this work is centered on aeronautic radio, and at present the problems nearing solutions or still under investigation include-

A device for the simultaneous transmission of radio telephone weather broadcasts and visual-type radio range beacon signals on the same frequency.

A system of radio aids to facilitate blind landings of aircraft.

A new improved type visual radio beacon course indicator.

A simple direction-finder for aircraft.

A device known as a deviometer, which permits a pilot to follow any chosen fixed radio beacon course within 15 degrees on either side,

Other research problems are directed at the reduction of noise from airplane engine exhausts by the use of mufflers; the development of crash-proof tanks; the control of airplanes at low speeds by means of conventional ailerons; a continuation of the study of welded aircraft joints and research into various phases of aeronautical lighting, including airplane run- (Continued on page 96)

## SPEED IN AIR TRANSPORT

### By Captain Frank T. Courtney

HAT the object of aviation is speed is generally recognized. But it is as generally overlooked that the object of commercial aviation is speed per dollar. Obviously there is no use flying so slowly that there is no advantage over other methods of transport. But it does not seem to be generally realized that it is possible to fly at such high speeds that a profit cannot be made.

A great increase of costs with higher speeds is a very definite factor in all forms of transportation, aviation being no exception.

Yet there are those who believe that the greater the speed in flying the less time is required and therefore the cost is less

Those who raise these arguments labor under two principal misapprehensions. In the first place, they appear to think that the speed of the plane has a very close relation to the speed of scheduled air transportation, whereas examination of the basic factors will show that this is not so. Secondly, the idea seems to be spreading that extra speed may be attained at very little sacrifice, which again shows that the real facts have not been studied by those who accept this idea.

To be really fast, transportation must contain two factors: high speed and regularity. Any delay or failure to run represents a reduction in the average speed of travel. For example, if the 3,300 miles from New York to Paris is flown in thirty-three hours the average speed is 100 miles per hour. But if it is necessary to wait two weeks for weather, as often happens, the average speed is nine miles per hour.

Air transportation today, in the aggregate, is a very slow way of getting about. Frequently, in fact, if air transportation had not the train service to fall back upon it would be slower than a buggy. To prove this some operator could make the following calculation: take his records for the past twelve months and estimate the average speed from point of departure to destination of an imaginary group of travellers who booked tickets on every schedule. Sometimes they arrived on schedule by air, sometimes the plane did not run at all or ran only part of the way and the passenger had to find a train and continue by rail. At a guess I would say the average speed of air travel on many airlines would, thus calculated, work out at something under fifty miles per hour even though they are using planes with a speed of 120 miles per hour. If one were to take those same passengers, imagine that they had no train service to fall back on and calculate their average speed of travel entirely by air, the figures would be even more surprising. In any case such calculations would certainly show an immense gap between the speed of the planes and the average speed of the passenger. That would prove that real speed and economy in air travel are to be acquired not so much in the increased speed of the plane but rather in the improvement of operation methods to close up this gap.

The Post Office Department might well make similar calculations for the average speed of letters from sender to receiver. If it did, I think it would have less desire to incur the enormous additional expense of operating at 140 miles per hour rather than 100 miles per hour.

The three solutions of real speed in air transport today are blind flying, more blind flying and still more blind flying. Increase in the speed of the airplane is a relatively minor factor. Air transportation apparently has yet to hear the fable of the hare and the tortoise. By going slower and carrying more load the necessary crew and equipment for blind flying can be carried and greater average speed attained as a result. For short haul work improvement in ground transportation between airport and city is clearly important, but this is a more or less obvious problem.

The next thing to consider is how these much-discussed high speeds are to be obtained. I have talked to operators who appear definitely under the impression that the value of high speed is quite a new idea, and that with little or no sacrifice we can now get high speeds from our planes just by helping ourselves to more miles per hour. These discussions show that such operators have made only the most superficial examination of facts. Two types of comparison, and one is preferred to the other on the more obvious facts of performance, without examining how this performance is obtained.

About a year ago, it was found in a popular transport plane that, by lowering the motors a few inches, a very considerable increase in speed was obtained. Other things remained equal, with the result that the additional speed was a free gift towards cheapness and economy. Many people missed the fact that this was not a normal increase in speed; it was merely the discovery of considerable inefficiency—so to speak, the plane had been running with the brakes on; somebody had discovered it and taken the brakes off.

This kind of thing seems to have led many operators to the veneration of a new and mysterious god called "Cleaning Up." If your plane does 100 miles per hour and you want it to do 120, you just "clean it up." If after that, you want 140 miles per hour, you just "clean it up" some more—and so on. In other words, you avoid the factor of increasing costs with increasing speeds by merely helping yourself to free speed.

This, on the face of it, is absurd, because if it were possible to get appreciably more speed out of a plane by some easy cleaning up, it would prove merely that it was a very poor design in the first place. The cleaning up idea seems to run to the streamlining of various parts and fittings, putting pants on wheels, retracting landing gears and similar devices. In the 'design of new ships, on the cleaning up theory, everything is beautifully streamlined into everything else and thus speeds are obtained which, it would appear, nobody had thought of before. Actually, in all this, you are not getting any free speed. You are paying for it just the same and the whole question is whether you are getting your money's worth. Fairings placed around fuselages and various fittings all add to the weight. If they are

(Continued on page 100)

## THE BLIND SPOT

### By Don Rose

Some Times it seems a sorry shame that all the big shots of the distant past are dead and gone to glory. If we could consult with some of them, we might find the answer to the riddles they left behind them. For lack of an eye-witness we spend a vast amount of time and energy in guessing our way among the dust, cobwebs and rubbish heaps of the past.

This may be why we get so little help from experience while trying to muddle our way out of a present emergency. The world today is like a man with a bad cold in the head. The fact that there have been bigger and better colds in the head is of no help to him at all. The fact that so many have survived them gives him no confidence

in his own ultimate recovery.

So it may not be surprising that people in perplexity grow impatient with the guidance of the past and turn so readily to those who claim for knowledge of the future. You may suppose, bless your innocence, that such superstition is gone out of date. You will be wrong. It is the estimate of reliable authorities that there are at least 125,000 fortune tellers, mystics, palmists and readers of the bumps on the brain doing business at the moment in the United States of America. There is a smaller but impressive number of mediums, psychics and astrologers making an immoral living by telling what will happen tomorrow, and this doesn't include the prophets of the Weather Bureau.

Even a little experience with these voodoo artists is sufficient to discover that the future is not much more helpful than the past in giving guidance for the present. It seems to be required of us that we must win or lose

according to the hand that is dealt us today.

That sounds simple, but there is a trick in it. For it is a curious fact that most of us have a blind spot in our vision of what goes on beneath our very noses. It is certainly true of economists, who can explain the panic of 1857 much better than the depression of 1931. It is true of philosophers and moralists, who can tell the difference between good and bad in the Middle Ages but couldn't give an accurate rating of their own stenographers. It is true of historians, who can explain the Thirty Years War, but couldn't see the World War coming when it was six weeks away nor tell us what it was all about thirteen years after it ended.

It is true, unfortunately, of those of us who try to determine the trend of the times and its effect on aviation. The blind spot bothers us badly as we study which way the cat will jump. We think we see the cat, and we think she is going to jump. But we know remarkably little

about the cat.

I am thinking of the possibility that the future will look back to these days and say they were a turning point in human history. Most of us have no suspicion of it as we go about our daily business. But there are plenty of signs and evidences to that effect. But they are like straws in the wind, and busy people have little time to look at straws. And most of them lie in the blind spot, so close to us that we can't see them clearly. It is quite possible, for in-

stance, that we are all playing a part today in an industrial revolution more important than the one brought about by the discovery of steam power. It is not unlikely that Ghandi in India, the Japs in Manchuria and unrest all over Asia are symptoms of a rearrangement of the world's political geography. It is almost certain that the financial systems of the world are under permanent reconstruction, that the relations of capital and labor are profoundly changing and that great empires are falling to pieces all around us.

But we aren't aware of these things, just as a man in a muddy trench on the Western front in the winter of 1917 knew nearly nothing about the progress and prospects of the War. Sometimes he wasn't sure that there really was a war. He had so many private matters to attend to that he couldn't be bothered with a war. He had to keep alive and get his fair share of rations and keep down the cooties and clean his rifle and curse his commanding officers and obey their orders. And meanwhile the war went on.

We won't take time to discuss all that may be going on behind the blind spot. Some of us may last long enough to discover that we lived through a revolution, an earthquake, a day of judgment and an economic Armageddon, and didn't learn about it until long after it was all over. But we may consider briefly what this has to do with aviation.

Aviation belongs principally to the province of transportation. Airplanes serve some other purposes, of course, but their only decent duty is to carry passengers and freight from here to there as quickly as possible. If the process of change, decay and reconstruction is affecting transportation, therefore, as much as seems to be the case in other phases of civilization, it is a matter of considerable importance to the flying business.

It is not easy to see beyond the blind spot. But this much is certain in transportation-that its chief changes are all in favor of speed. The signs of it are in the earth and sea and sky. You may have heard, for instance, that these have been bad years for the steamship companies. But in three countries they are building liners that are to be faster than anything that floats today. The railroads are rather sick, and the doctoring of the I.C.C. makes them feel no better, but they have just cut hours from the time of the crack trains across the continent. The latest thing in interurban transportation is the streamlined electric car. One of them made more than sixty miles an hour last month in a trial near Philadelphia. It ran into something subsequently and got badly bent, but that was only an incidental interruption to the big idea. Over in Germany they have made a super-trolley travel more than 100 m.p.h. by using an airplane engine and propeller on a streamlined coach. If they can keep it on a track, it's going to be a big convenience to suburbanites like myself and permit me to get a shave and breakfast on the same

It needs no argument that all that favors speed is in (Continued on page 99)

# ZEPPELOONATICS AT LARGE

by baldwell

VER the Naval Air Station at Lakehurst, New Jersey, on the morning of November 3, 1931, there brooded an air of tense expectancy. The Akron, new queen of the skies, shuddered at her moorings in the huge airship dock; her commander, Lieut. Commander Charles E. Rosendahl, stood ready to board; her crew, drawn up in a quivering group, wore the look of men awaiting the command that would send them forward to grapple with some unseen enemy.

It was just five o'clock of a clear fall morning. The cavernous airdock, unwarmed as yet by the rays of the morning sun, held that dread chill familiar to bank presidents who visit their vaults to examine frozen assets.

The officers and men boarded the airship, already moored to her traveling stub mooring mast, and took their appointed places. Tensely they waited. The Los Angeles, already in the air, was moving away from Lakehurst. Only the Akron and her devoted crew awaited the arrival of that sinister something.

At the fatal hour of six a.m. several cars drew up to the airdock's entrance and from the vehicles descended a crew of newspaper reporters, photographers, radio men, magazine feature writers, special correspondents, publicity



Cy posing as a member of the crew in the emergency control room in the Akron's lower fin

men, and other subnormal growths.

As the order, "Prepare to repel boarders!" rang out, the brave men of the \*Akron's crew grasped wrenches, hammers, and blackjacks, evidently prepared to sell their lives as dearly as possible. "If them birds get aboard here," growled a bo'sun, "it'll be only over my dead body." What was their dismay, however, to learn that each one had come armed with a Naval Order—a practically sacred document—ordering the commander of the \*Akron\* to surrender his ship without a struggle! Filled with dismay the crew watched the horde scramble aboard, trampling on anything breakable, stumbling over wires, knocking the ship's cat off its own catwalk, and otherwise conducting themselves after the manner of literary and photographic men out for an airing.

The crew of the captured airship did the only thing possible in the circumstances—they prepared to get their craft into the air, doubtless hoping that at least a few of this army of invaders would stumble and fall out of the ship before breakfast. It was a forlorn hope, however, for the moment the Filipino mess attendants placed food on the mess room tables, it was seized and devoured by the hungry barbarians, of whom, unfortunately, not a single one was missing.

Sherman Altick of the New York Sun, than whom no man carries more weight in the world of words, furnished a momentary diversion, for as he was preparing to heave his amazing bulk aboard the airship, a small boy was discovered in the act of trying to stow away on Mr. Altick—evidently under the impression that Mr. Altick was the Akron itself! A search party hastily organized by a Chief Petty Officer boarded Mr. Altick, made a search, and discovered the culprit hiding under one of Mr. Altick's chins.

Perhaps you six readers have noticed that up to this point of departure I have refrained from mentioning myself. But the truth is that until the ship was well in the air I kept very quiet—almost invisible, in fact—lest some admiral spot me and recall sundry articles of mine on the subject of the battleship which might lead to my ejection from this air cruiser. However, the only admiral in sight was Admiral William A. Moffett, who started out as a water-cooled admiral but was converted into an air-cooled job, and as such has been functioning with great efficiency ever since. I emerged from under an engine where I had secreted myself, and proceeded to watch the take-off.

I shall try to describe what happens before and after the mystic command, "Up ship!" rings out. I'm slightly handicapped as I observed the maneuver while lying flat on my stomach, sandwiched in between two other gatherers of news. There we lay, in a companionway along the side of the mess deck, much after the manner of sardines in a tin, with the exception that we could look out of large, slanting windows in the Akron's hull. Now, the newshounds—called daschunds in Germany—who were given



Photo by Lt. Harper, U. S. N.

Despite its weird literary cargo, the "Akron" sailed majestically over New York City

places in the control cars could see and hear everything. But all that I and the other bits of flotsam and jetsam could see from our positions was simply that portion of the floor of the airdock beneath the windows in the hull. At this we stared intently, most of us simply staring, while others of us scribbled industriously. What they found to write about I don't know, for all we could see was the floor of that hangar. However, various uniformed men were walking around, and there was about the place an air of coming events. In fact, even as we watched the floor, it began to move back toward the stern of the Akron. At least, there was no sensation of motion aboard the airship: she was simply stationary in the air, and first the floor and then the sands of Lakehurst field were pulled back by some invisible mechanism. That's how smoothly the big ship was towed out of the dock by her powered mobile mooring mast.

For many minutes those of us in the hull stared at the sandy soil of New Jersey, a part of the hangar, and sundry buildings at the edge of the field. Of the rest of the ship we could see nothing but one propeller, which even as we watched turned from a vertical to a horizontal plane, and began to revolve. There were dull rumblings from distant parts of the ship, the persistent, humming sound of a dynamo, and the occasional grunt of a literary gentleman removing his weight from his breastbone. Still, there were no sounds that would indicate to an old airplane pilot that an ascent had begun, so it was with considerable surprise that I looked down and saw several brown mice running, on their hind legs, across the sand-to realize in a moment that they were not mice, but men, and that we were several hundred feet in the air. It was as smooth and easy as that!

Éven as I watched it, the propeller, which had been drawing us upward, turned slowly into the vertical plane, and evidently joined the seven other propellers that I could not see, in the business of pulling the ship forward. For forward we went, though so smoothly and with such an absence of vibration that the illusion grew that we were standing still while the earth was dragged backward. The rumbling noise of our propellers and engines seemed to be somewhat greater than the noise of a railroad train, but considerably less than the sound of a subway express.

What interested me immediately after the start of our flight was the tantalizing odor of bacon and eggs and coffee. I rose from the floor and followed my nose to the galley, a compartment about the size of a \$3 hotel room on the light shaft. Here, over a gas range, a gentleman of undoubtedly noble nature was bending. In his hand he held a pancake turner with which he was shovelling slices of bacon and happily mated pairs of eggs onto plates, which two serious Filipinos were making off with. Restraining my first impulse to tackle the Filipinos and wrest their burdens from them, I merely slunk along behind them, past two small rooms fitted with tables and chairs to accommodate a dozen people each, and came to another room marked "Officers Mess." Here several officers were seated, in a desperate effort to get their breakfast aboard before all of the newspaper men had learned the location of this magic room, which was furnished with an aluminum table and seven chairs, an aluminum sideboard, aluminum eating utensils, and Beetleware plates, cups, and saucers.

Casually knocking two rather cod-browed special correspondents out of my path, I glided—or stalled—into a chair immediately before which the trusting Filipino had deposited the plate of bacon and eggs. By the time he had managed to inform me that this chair had been reserved for the Admiral himself, one egg and half the bacon already had disappeared and I was reaching out here and there for toast, butter, sugar, cream, and other oddments. It was the first time in my many hours in the air, covering a period of over sixteen years, in which I had sat down to real food, served in an air-going vehicle. Sandwiches

(Continued on page 102)

## AIR—HOT AND OTHERWISE

HE picture in the center of this page attracted my attention as it hung in the office of one of Admiral Moffett's aides in Washington. A copy of it should be on the

wall of every aircraft executive in the United States.

It admirably symbolizes the one thing most necessary to the right development of American aeronautics at the moment.

What we need is teamwork—teamwork plus! We must have it to put back the appropriations which have been cut from the estimates of both the Army Air Corps and the Bureau of Aeronautics, including that which will give the Reserves flying-time, material, everything. This could be done, can be done, and if the right kind of organization

is put behind the effort, will be done. It must be done. If it is not done the near future will see America's air effort deficient in even more details than at present.

This industry is going to be shocked when it learns what the budget heads have done to their estimates of appropriations needed. But it must not faint away. Everyone in Washington feels, even if unwilling to say, that cuts are inevitable.

But is our job to see to it that we do not bear more than our share that we do not bear so much that the country will suffer too severely, and that our industry shall not be destroyed by a short-sighted economy wave.

The nation must have economy, but we've got to have protection from more of it than would be safe for either the nation or ourselves. That protection will come from no one except ourselves.

Members of Congress must be shown the necessity for putting back these sums which have been preliminarily eliminated from our appropriation bills. The industry must be in a position to develop those things which it is obvious that the Government will need and may need badly, even if this shall mean the change of existing laws.

In this emergency there can be no watchword for us except teamwork.

Teamwork is essential if we are to secure the necessary domestic and foreign air mail appropriations; it is necessary if we are to take constructive testimony into the hearings of the investigation committees that will get to work as soon as Congress convenes; it is necessary in every branch of the industry—engineering, production, domestic sales, export.

And teamwork will do the trick for us as it has done it for other industries. If you don't remember the "Save the Surface" campaign of the American paint manufac-

### Frank A. Tichenor

turers, get some advertising man to tell you its inspiring details. It preserved them from destruction by foreign competition and inertia, as their product could and now does preserve

the "surface" of almost everything American. That effort was desperately needed; it was intelligent and effective. It worked. In three years it quadrupled sales. It taught individuals of the industry how to sell their product. It taught consumers how to use it so as to get the best value out of it. It taught everybody teamwork. Especially the manufacturers learned that they could well afford to help each other get new orders instead of cutting one another's throats. In eight years this campaign organized an industry that at the start was as chaotic as the aircraft industry seems today.

as fast.

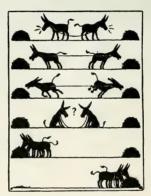
Let's begin 1932 by following in the footsteps of the nation's most intelligent businessmen. We can do well if we try. Certain branches of aeronautics have gone ahead independently of the balance of the industry. With intelligent cooperative work they could go ahead five times

So, from the very start of 1932, let's work together, pulling all the chestnuts out of the fire and dividing them after we get them out instead of letting the fire destroy them as we fight to see who shall get at them

Teamwork must produce the appropriations for aircraft carriers up to the allotted tonnage before the shippards can produce the carriers themselves. Aircraft carriers will mean sales to the Government of aircraft that the safety of the nation positively demands and that the

prosperity of the industry as positively requires. If these are not started before 1932 the Disarmament Conference probably will prevent them from ever being built at all. It is the plain duty of the industry to forestall such a grim situation. The United States must be as safe as is allowed under its agreements. These carriers have been allowed to us. All other nations have built or are building up to their allotments. We have done nothing with regard to these essential carriers. We must do something—something quick, worth while, energetic—if we ever are to launch them.

This picture of the Army mules was on Admiral Moffett's walls. The mule is the Army's animal. But you can't fool the Admiral. He takes a good thing wherever he may find it. Even a picture of a pair of mules. Even a picture of a pair of Army mules. He is first for the Navy. But if an Army mule has a good idea he won't reject it because the mule is not a Navy goat. Let us profit by his grand example.



Teamwork

## ATLANTIC FLIGHT CHRONOLOGY

HERE is no denying the spirit of youth and accomplishment. Human competition has made whatever one may consider the "having-worth" of things that are today.

Art, science and industry have ever taken their toll among those who ventured beyond the line of common practice, and it is but natural that the most magnificent problem ever set for man should pay even in proportion.

Rather than discourage these feats, air opinion has inclined to their encouragement when safeguarded by the best equipment, adequate preparation and most competent pilotage.

The great transcontinental and transoceanic flights of the past years have stimulated inventive genius, encouraged skill and stirred increased study by all those agencies which are contributing so much to the bringing of light within the common use of all.

Out of 118 take-offs between 1873 and December, 1931, there have been sixty-three successful air crossings of the Atlantic ocean, North and South. Other voyages reached their destinations by their own means or were found and brought to other ports. Eleven craft-crews have been lost in the course of these actual flights, beginning with the loss of Romain and Mountayres in their attempt to cross the South Atlantic in 1927.

The accompanying tabulation shows the attempted and successful balloon, airship and airplane crossings. Still others have been projected and subsequently abandoned. Many great flights have also been made across other large bodies of water and in coastwise flying.

Completed journeys in the accounts which follow are indicated in bold face type,

#### THE ATLANTIC FLIGHTS

1873

1. Oct. 7. FIRST ATTEMPT. William H. Donaldson, Alfred Ford and George A. Lunt of the Daily Graphic in the balloon Graphic from Brooklyn, N. Y.; landed at New Canaan, Conn.

1910

 Oct. 15. FIRST AIRSHIP AT-TEMPT. Walter Wellman and crew from Atlantic City, N. J., abandoned the airship America some 800 miles out and the party was rescued by a steamer in response to distress signals.

1919

3. May 18. Harry C. Hawker and

Following is a tabulation of completed air crossings of both North and South Atlantic in either direction chronologically. \*Indicates airship.

|     |                                      | _         |     |          | _              |
|-----|--------------------------------------|-----------|-----|----------|----------------|
| 1   | Read                                 | Eastbound | No. | Atlantic |                |
| 2   | Alcock-Brown                         |           |     | Atlantic | 1st non-stop   |
| *3  | Scott                                | Westbound | No. | Atlantic | 2nd non-stop   |
| *4  | Scott                                | Eastbound | No. | Atlantic | 3rd non-stop   |
| 5   | Cabral-Coutinho                      | Westbound | So. | Atlantic |                |
| 6   | World Fliers                         | Westbound | No. | Atlantic |                |
| 7   | World Fliers                         | Westbound | No. | Atlantic |                |
| *8  | Eckener, ZR3                         | Westbound | No. | Atlantic | 4th non-stop   |
| 9   | Major Franco                         | Westbound | So. | Atlantic |                |
| 10  | De Barres                            |           |     |          |                |
| 11  | Pinedo                               | Westbound | So. | Atlantic |                |
| 12  | De Beires                            |           |     |          |                |
| 13  | Lindbergh                            |           |     |          | 5th non-stop   |
| 14  | Pinedo                               |           |     |          |                |
| 15  | Chamberlin                           |           |     |          |                |
| 16  | Byrd                                 | Eastbound | No. | Atlantic | 7th non-stop   |
| 17  | Brock-Schlee                         |           |     | Atlantic |                |
| 18  | Costes-Lebrix                        | Westbound | So. | America  | 9th non-stop   |
| 19  | Von Huenefeld                        |           |     |          |                |
| 20  | Stultz-Earhart                       |           |     |          | 11th non-stop  |
| 21  | Del Prete                            |           |     |          |                |
| *22 | Eckener                              |           |     |          |                |
| *23 | Eckener                              |           |     |          | 14th non-stop  |
| 24  | Jiminez-Iglesias                     |           |     |          |                |
| 25  | Assollant-Lefevre                    |           |     |          |                |
| 26  | Williams-Yancey                      | Eastbound |     |          | 17th non-stop  |
| *27 | Eckener                              | Westbound | No. |          |                |
| *28 | Eckener                              |           |     |          |                |
| *29 | Lehmann                              | Eastbound | No. |          | 20th non-stop  |
| 30  | Challe-Borges                        | Westbound | So. | Atlantic | 21st non-stop  |
| 31  | Mermoz                               |           | No. | Atlantic | 22nd non-stop  |
| *32 | Eckener                              | Westbound | So. | Atlantic | 23rd non-stop  |
| *33 | Eckener                              | Westbound | So. | Atlantic | 24th non-stop  |
| 34  | Kingsford Smith                      | Westbound | No. | Atlantic | 25th non-stop  |
| *35 | Booth                                |           |     |          |                |
| *36 | Booth                                |           |     |          |                |
| 37  | Capt. von Gronau                     | Westbound | No. | Atlantic |                |
| 38  | Costes-Bellonte                      |           |     |          |                |
| 39  | Boyd-Connor                          | Eastbound | No. | Atlantic | 29th non-stop  |
| 40  | 50 Balbo with 11 planes              | Westbound | No. | Atlantic | 30th-40th n-s. |
| 51  | Christiansen                         |           |     |          |                |
| 52  | Post-Gatty                           |           |     |          |                |
| 53  | Hoiriis-Hillig                       | Eastbound | So. | Atlantic | 42nd non-stop  |
| 54  | Endres-Magyar                        | Westbound | So. | Atlantic | 43rd non-stop  |
| 55  | Boardman-Polando                     | Eastbound | No. | Atlantic | 44th non-stop  |
| 56  | Boardman-Polando<br>Herndon-Pangborn | Eastbound | No. | Atlantic | 45th non-stop  |
| 57  | Capt. W. Von Gronau                  | Westbound | No. | Atlantic |                |
| *58 | Eckener                              |           |     |          |                |
| *59 | Eckener                              |           |     |          |                |
| *60 | Lehmann                              | Westbound | So. | Atlantic | 48th non-stop  |
| *61 | Lehmann                              |           |     |          |                |
| *62 | Lehmann                              |           |     |          |                |
| *63 | Lehmann                              | Eastbound | So. | Atlantic | 51st non-stop  |

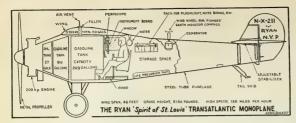
McKenzie Grieve (Sopwith-Rolls 375 open land biplane) from St. Johns, N. F., in competition for the London Daily Mail \$50,000 prize for first crossing. Engine trouble developed some 1200 miles out and descent in the ocean alongside steamer after 14½ hours' flying.

4. May 18. Captain F. P. Raynham and C. W. F. Morgan (Martynside-Rolls 285) attempted the trip an hour later but broke an axle in taxying.

5. May 16-31. FIRST AIR CROSSING. Commander A. C. Read, Lt. E. F. Stone, Lt. Walter Hinton, Ensign H. C. Rodd, Lt. J. L. Breeze, Chf. Mchsts. Mate E. C. Rhodes, (N.C. 4, 4 Liberty 400 open sea biplane) from Trepassy Bay, N. F., to Plymouth, England, with stops at Azores, Lisbon, Mondego River, and Ferrol. Total distance 4791 miles; from Trepassy Bay to Lisbon, 2437 miles. Left New York May 8. Total flying time 53:58:00 New York-Plymouth.

6. May 16-17. Lt. Comdr. P. N. L. Bellinger, Lt. Comdr. M. A. Mitscher, Lt. L. T. Barin, Lt. H. Sadenwater, Chf. Mchsts, Mate C. I. Kesler and Mchst. R. Christensen in the N.C.1 from Trepassy Bay. Landed at sea on the 17th about 200 miles short of Horta, Azores. After 5 hours' running on the surface the party was rescued by destroyer.

7. May 16-19. Comdr. J. H. Towers,



Comdr. H. C. Richardson, Lt. D. H. McCullough, Lt. Comdr. R. A. Lavender, and Mchst. L. R. Moore in the N.C. 3 from Trepassy Bay. Landed at sea and reached shore by running on the sea some 60 hours, covering 233 miles to Horta.

8. June 14. FIRST NON-STOP CROSSING. Capt. John Alcock and Lieut. Arthur W. Brown, an American, from St. Johns, N. F., to Clifden, Ireland (Vickers—2 Rolls 375 land biplane), 1890 miles in 16:12:00.

9. July 4. Rear Admiral Kerr, Major T. Gran and Major Brackley (Handley Page—4 Rolls 350 land biplane) damaged their craft in a start from Harbor Grace

and abandoned the venture.

10. July 2-6. FIRST AIRSHIP CROSSING: FIRST ROUND TRIP. British rigid airship R-34 (5 Sumbeam 250 hp engines), commanded by Major G. H. Scott, from East Fortune, Scotland, to Mitchel Field, Garden City, N. Y., non-stop, 3270 miles in 108:12:00. Lt. Comdr. Zachary Lansdowne, U.S.N., was on board on the westward trip. The total personnel included 10 officers, 17 of crew and 2 radio operators.

11. July 9-12. Col. William N. Hensley, Army Air Corps, replaced Lansdowne on the 75-hour return trip to Pulham, England, July 9-12.

#### 1922

12. Mar. 30-Apr. 18. FIRST SOUTH ATLANTIC CROSSING. Captains Sacadura Cabral and Admiral Gago Coutinho (Fairey-Rolls 375 biplane seaplane) from Lisbon, Spain, to St. Paul's Rock, 3000 miles, with stops at Las Palmas, Canary Isls, St. Vincent, Cape Verde Isls., and Porto Praya. Machine damaged. Balance of flight to Fernando Noronha and Pernambuco, Brazil, and thence with 3 stops to Rio Janeiro completed subsequently. From Lisbon to Pernambuco by route 3750 miles.

#### 1924

13-14. July 17-Aug. 31. FIRST WESTBOUND AIRPLANE CROSS. ING, Air Corps "Round World Fliers." Lt. Lowell Smith with Lt. Leslie P. Arnold and Lieut. Fric H. Nelson with Lieut. John Harding in the Chicago and the New Orleans (Douglas-Liberty 400 sea biplanes) crossed from Brough, Scotland, to Ice Tickle Bay, Labrador, with intermediate stops at Kirkwal, Hornafjord, Reykjavik, Frederiksdal and Ivigtut, 2850 miles, flying time 39:23:00.

15. Lieutenants Leigh Wade and H. H. Ogden had alighted in the ocean en route to the start and were later rescued by a trawler and brought in by a U. S. destroyer.

16. Aug. 21. Signor Locatelli (Dornier Wal, 2 Rolls flying boat), Italian pilot attempting a world flight from Rome, took off from Reykjavik for Frederiksdal, Greenland, in company with the U. S. Army Air Corps "World Fliers." Locatelli, with his aide and 2 mechanics, alighted on the ocean through engine trouble. They were rescued 3 days later by a U. S. destroyer.

17. Oct. 12-15. THIRD AIRSHIP CROSSING. German airship ZR3 (later the Los Angeles), powered by 5 Maybach 400 hp engines, crossed the Atlantic from Friedrichshafen, Germany, to Lakehurst, N. J., via the Azores and Newfoundland, 4010 miles air line in 81:17:00.

In addition to the commander Hugo Eckener, officers and men comprising the total personnel of 32, were the following Americans: Comdr. Klein, U.S.N.; Lt. Commdr. Kraus, U.S.N.; Major Frank M. Kennedy, U.S.A. Air Corps; and Captain Steele, U.S.N.

#### 1926

18. Jan. 22-31. NINTH AIR CROSSING. Major Ramon Franco, Capt. Ruiz de Alda, Pilot Duran, Mechanic Rada in the Ne Plus Ultra (Dornier Wal, 2 Napier 450 mono flying boat), from Palos de Moguer, Spain, to Pernambuco, Brazil, a 3879 mile route, in 37:25:00 flying time with stops at Canary Isls., Bay de Gando, Porto Praya, Ribera de Inferno and Fernando de Noronha where Duran left the party. From Pernambuco they continued to Rio de Janeiro. Montevideo and Buenos Aires.

#### 1927

19. Sept. 21. Capt. Rene Fonck, Curtin, Clavier and Islamoff (Sikorsky, 3 Rhone 420 land biplane) crashed in take-off at Garden City, N. Y., in proposed oceanic flight.

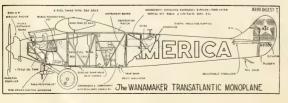
20. Oct. 25-Apr. 28, 1927. Toao Ribeiro de Barres, Cunha, Capt. Newton Braya, Lt. Joao Negrao, and Vasco Cinquini in the Jahu (Savoia 55, 2 Isotta 550 mono flying boat) from Gibraltar, Spain, to Natal, Brazil, with stops at Las Palmas, Cape Verde Islands, and Fernando de Noronha, 3,519 miles, in the course of a flight from Genoa, Italy, to Sao Paulo, Brazil. The entire flight included stops at Alicante, Gibraltar, Las Palmas, Cape Verde Islands, Fernando de Noronha, Natal, Recife, Bahia, Rio de Janeiro and Santos. They arrived in Rio July 27, 1927. Cunha was dropped at Las Palmas.

21. Feb. 19-24. General Francesco de Pinedo, Capt. del Prete and mechanic Zachetti in the Santa Maria, (Savoia 55, 2 Isotta 500 mono flying boat) from Dakar, Senegal, to Port Natal, Brazil, 2200 miles, with stops at Porto Praya, (Cape Verde Isls.) and Fernando Noronha, continuing to Rio de Janeiro and the United States in the course of a tour from Rome and return.

22. Mar. 2. Maj. Tadeo Larre-Borges, his brother, Capt. Ibarra, and mechanic Rigoll (Dornier, 2 Farman 500 mono flying boat) left Casablanca for South Atlantic flight but turned back be-

cause of oil leak.

23. Mar. 16-18. Lt. Col. Sarmento de Beires, Duvalle Portugal de Castilho and Gouveia in the Argos (Dornier Wal, 2 Lorraine 450 mono flying boat) from Bolama, Portuguese Guinea, to Fernando Noronha, Brazil, 1560 miles in 17:30:00. After refueling the flight was continued the same day to Natal, Brazil, 1800 miles in all, and thence to Pernambuco, Bahia and Rio de Janeiro June 15. The flight started at Pisa, Italy, Mar. 2.



24. May 5. Capt. St. Romain, Comdr. Mountayres and Petit (Farman-2 Lorraine 450 land biplane) lost between St. Louis, Senegal, and Pernambuco on a flight from France to Buenos Aires.

25. May 8. Captains Charles Nungesser and Francois Coli in the Oiseau Blanc (Lavasseur-Lorraine 450 land biplane) from Paris for New York. Lost

at sea.

26. May 20-21. FIRST FLIGHT TO FRANCE. Capt. Charles A. Lindbergh in the Spirit of St. Louis (Ryan-Wright 200 cabin land monoplane) from Roosevelt Field, New York, to Le Bourget Field, Paris, the 13th Atlantic crossing and 5th non-stop tlight,

3620 miles in 33:29:30.

27. May 23-June 13. General Francesco de Pinedo, Capt. del Prete and mechanic Zachetti in the Santa Maria II (Savoia, 2 Isotta 500 flying boat) from Trepassy, N. F. After 12 hours' flying they alighted, May 23, on the water about 160 miles from the Azores, 1350 miles from the start, and were towed to the Azores. On June 10, after repairs, they returned to the point of landing and continued the flight. On June 13 they arrived at Lisbon, Portugal, after stop at St. Michaels, 2,420 miles in all. They completed their trip at Rome on June 16, after covering some 25,175 miles in their complete circuit, Rome to Rome.

28. June 4-5. FIRST FLIGHT TO GERMANY. Clarence D. Chamber-lin and Charles A. Levine in the Columbia (Bellanca-Wright 200 cabin land monoplane) from Roosevel Field, to Eisleben, Germany, 3930 miles, in about 42:00:00, world distance air line. On June 7 they continued to Berlin with one intermediate stop. Fifteenth Atlantic

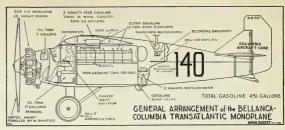
crossing and 6th non-stop.

29. June 29-July 1. Commander R. E. Byrd, Bert Accosta, George O. Noville and Bernt Balchen in the America (Fokker, 3 Wright 200 cabin land monoplane), Roosevelt Field, New York, to Ver-sur-Mer, France, 3490 miles, where landing was made in the sea. Elapsed time 40:00:00. Sixteenth crossing; 7th non-stop.

30. Aug. 14. Risticz, Edzard, Knickerbocker in the Europa (Junkers 33-Junkers 280-310 cabin land monoplane) from Dessau, Germany, for New York. Landed at Bremen with engine trouble and flight discontinued.

31, Aug. 14. Baron G. von Huenefeld, Capt. Hermann Koehl and Friedrich Loose in the Bremen (Junkers-Junkers 280-310 metal cabin land monoplane) started from Dessau, Germany, for New York. After covering about 2510 miles in 22 hours they landed at the point of departure.

32. Aug. 27-28. FIRST AIR-PLANE FLIGHT TO ENGLAND. William S. Brock and William F. Schlee in the Pride of Detroit (Stinson-Wright



200 cabin land monoplane) from Harbor Grace, N. F., to Croydon, England, 2350 miles in 23:21:00 in the course of a flight to Japan. Eighth non-stop air crossing.

33. Aug. 31. Capt. Leslie Hamilton, Col. Frederick F. Minchin and Princess Lowenstein-Wertheim in the St. Raphael (Fokker-Bristol 450 cabin land monoplane) from Upavon airdrome, England, for Ottawa, Can. Last reported 420 miles SE of New York.

34. Sept. 1. Duke Schiller and W. Wood in the Royal Windsor (Stinson-Wright 220 cabin land monoplane) from Windsor, Can. Landed near Quebec in fog and rain. Trip abandoned.

35. Sept. 2. Leon Givon and Chas. Corbu in the Oiseau Bleu (Farman, 2 Farman 500 land biplane) from Paris for New York. Returned to start after 2½ hours of bad weather.

36. Sept. 3. Frank Courtney, Lieut. Downer, Little (Dornier Wal, 2 Napier 450 cabin monoplane flying boat) from Plymouth. Landed at Corogne, Spain, in fog and rain; flight discontinued.

37. Sept. 6. Lloyd Bertaud, James Dewitt Hill and Philip Payne in the Old Glory (Fokker-Bristol 450 cabin land monoplane) from Old Orchard, Me., en route to Rome. Early the following day an SOS was picked up from the plane. Some weeks later wreckage was found at sea.

38. Sept. 7. Capt. Terry Tully and Lt. James V. Metcalf in the Sir John Carling (Stinson-Wright 200 land monoplane) took off from Harbor Grace, N. F., for London. No report.

39. Sept. 16. Capt. R. H. McIntosh

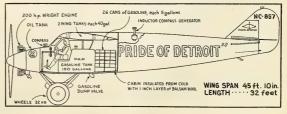
and Major James Fitzmaurice in the Princess Xenia (Fokker-Bristol 420 land monoplane) from Baldonnel, Ireland, for New York. After 6 hours of bad weather they returned.

40. Oct. 11-12. George Haldeman and Ruth Elder in the American Girl (Stinson-Wright 200 cabin land monoplane) in a flight from Roosevelt Field, New York. With engine trouble they alighted in the sea alongside a vessel some 350 miles from the Azores where the aviators were landed and the flight discontinued. Distance covered about 2620 miles.

41. Oct. 13-14. Frederick Loose, Karl Loewe, Fritzler, Ralph Starke and Lillie Dillenz in the D-1230 (Junkers, 3 Junkers 280-310 sea monoplane) from Lisbon for New York. After alighting in the water because of engine trouble they flew on to Horta in the Azores, 1050 miles, arriving the 14th. Balance of flight discontinued.

42. Oct. 14-15. FIRST NON-STOP SOUTH ATLANTIC FLIGHT. Capt. Dieudonne Costes and Lt. Joseph Lebrix in the Nungesser-Coli (Breguet-Hispano 600 cabin land biplane) from St. Louis, Senegal, to Natal, Brazil, 1980 miles in 18-05-00, in the course of a world tour covering some 24,846 miles from Oct. 10, 1927-Mar. 7, 1928. This was the 18th Atlantic crossing and the 9th non-stop.

43. Nov. 4. Horst Merz, Wilhelm Bocs and Fritz Rhode in the *D*-1220 (Heinkel-800 Packard sea monoplane) from Lisbon to Horta, Azores, in the course of a flight by stages from Warne-



munde, Germany, Oct. 12. On Nov. 13 they were about to take off for Harbor Grace when engine trouble resulted in a wreck and flight discontinued.

44. Oct. 23. Mrs. Frances Grayson, Stultz and Brice Goldsborough in the Dawn (Sikorsky, 2 Wright 200 amphibion monoplane) from Boston; returned

shortly and flight postponed.

45. Dec. 23. Mrs. Frances Grayson, Oskar Omdal, Brice Goldsborough and Fred Koehler in the Dawn (Silorsky, 2 Wright 200 monoplane amphibion) from Garden City, N. Y., for Harbor Grace, N. F., on trans-Atlantic attempt. Lost at sea.

#### 1028

46. Mar. 13. Capt. W. G. R. Hinchcliffe and the Hon. Elsie Mackay, in the Endeavour (Stinson-Wright 200 cabin land monoplane) from Cranwell, England. Last reported about 170 miles off

west coast of Ireland.

47. Apr. 12-13. FIRST NON-STOP WESTBOUND NORTH AT-LANTIC CROSSING BY AIR-PLANE, 19th air crossing of the Atlantic and the 10th non-stop. Baron G, von Huenefeld, Capt. Hermann Koehl and Major James Fitzmaurice in the Bremen (Junkers-Junkers 280-310 metal cabin land monoplane) from Baldonnel, Ireland to Greenly Island, N. F., 2070 miles in 37:00:00. Attempted flight to New York. Plane subsequently brought to New York by boat.

48. June 17-18. Wilmer Stultz, Edw. Gordon and Amelia Earhart in the Friendship (Fokker VII, 3 Wright 200 cabin sea monoplane) from Trepassy Bay, N. F., to Burry Port, Eng., 4449 miles in 20:40:00. From here they

continued to Southampton.

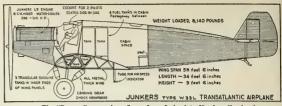
49. July 3-5. Maj. Carlo del Prete and Capt. Arturo Ferrarin (Savoia-Fiat 550 land monoplane) from Rome to Natal, Brazil, 4450 miles in 51:59:00.

50. July 22-3. Lt. Paulin Paris, Marot and Cadiou in *La Frégate* (CAM 5B, 2 G. R. Jupiter 420 seaplane) from Brest, France, to Horta, Azores, in 13:15:00. Flight abandoned on account of engine trouble.

51. July 26. B. R. J. Hassell and Parker D. Cramer in the Greater Rockford (Stinson-Wright 200 cabin land monoplane) for Scandinavia. Crashed attent 15 minutes attempting to rise over hills, at Rockford, Ills.

52. Aug. 1. Maj. Ramon Franco, Gallarza, Ruiz de Alda and Rada in the Numancia (Dornier Wal, 4 Napier 450 monoplane flying boat) from Lisbon. After 13 hours' flying, engine trouble caused to return to base.

53. Aug. 2. Frank T. Courtney, E. B. Hosmer, Hugh Gilmour and Fred Pierce (Dornier Wal, 2 Napier 450 mono flying boat) from Lisbon. Alighted in sea 5 hours later, aftre, about 650 miles



The "Bremen" monoplane flown from Ireland to Newfoundland

n.w. of Horta. Rescued after 18 hours as result of radio calls.

54. Aug. 3-4. Majors Louis Idzikowski and Kasimir Kubala in the Marshal Pilsudski (Amiot-Lorraine 650 land biplane) from Paris. After 35 hours they landed near a ship some 60 miles from the French coast on their way back, due to engine trouble, and were taken on board. They had reached a point north of the Azores.

55, Aug. 16-18. B. R. J. Hassell and Parker D. Cramer in the *Greater Rock- ford* (Stinson-Wright 200 cabin land monoplane) from Rockford, Ill., en route to Scandinavia via Greenland and Iceland. They landed in Greenland and walked 2 weeks back to Mt. Evans. One intermediate stop made at Cochrane. Can.

56. Aug. 25. Louis Coudouret, De Mailly-Nesle and Maillou (Bernard-Hispano 600). Fuel dumped in the takeoff at Paris and flight abandoned.

57. Sept. 4. Assolant, Lefvère and Lotti (Bernard-Hispano 600) from Paris to Casablanca and flight abandoned.

58. Oct. 11-15. RECORD NON-STOP DISTANCE AND DURA-TION FOR AIRSHIPS. Airship Graf Zeppelin (5 Maybach 530), in command of Dr. Hugo Eckener, 38 of crew and 19 passengers, from Friedrichshafen, Germany, to Lakehurst, N. J., 6160 miles in 111:38:00.

59. Oct. 17. Lt. Comdr. H. C. Mac-Donald (De Havilland Moth-Cirrus 85 open land biplane) from Harbor Grace. Lost at sea.

60. Oct. 29-Nov. 1. Airship Graf Zeppelin returned from Lakehurst to Friedrichshafen with 40 crew and 20 passengers in 75:33:00. 1929

61. Mar. 2-3. Captains Ignacio Jiminez and Francisco Iglesias in the Jésus del Gran Poder (Breguet-600 Hispano land biplane) from Seville, Spain, to Bahia, Brazil, in 44:00:00, 4067 miles. On Mar. 28 they continued to Rio de Janeiro, Santiago, Chile; up the west coast of South America to Havana.

62. May 18. Dr. Eckener in the *Graf Zeppelin*, with 40 crew and 18 passengers, landed at Toulon, France, after a storm with but 1 out of 5 engines running, after turning back near Valencia, Spain, on its way to Lakehurst. The ship left

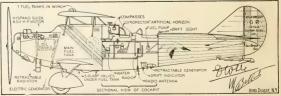
Friedrichshafen May 16.

63. June 13-14. Jean Assolant, René Lefèvre, Armand Lotti and a stowaway in the Yellow Bird (Bernard-Hispano 600 cabin land monoplane) from Old Orchard, Me., to Commillas, Spain, in 29:52:00, en route to Paris from New York.

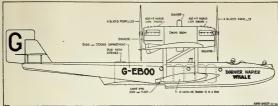
64. June 21-22. Maj, Ramon Franco, Capt. Ruiz de Alda, Capt. Gallarza and Sgt. Madariaga in the Numancia (Dornier Wal-Hispano 600 mono flying boat) from Alcazares, Spain. Several days later they were located adrift by British aircraft carrier near Azores where they had been forced to land.

65. July 3. Parker D. Cramer, Robert Gast and Robert Wood in the 'Untin' Bowler (Sikorsky, 2 P. & W. 420 cabin amphibion) from Chicago. After a series of stops they reached Port Burwell where the plane floated away from its moorings.

66. July 8. Roger Q. Williams and Capt. L. A. Yancey in the Pathfinder (Bellanca-Wright 200 cabin land monoplane) from Old Orchard, Me., to San-



Coste and Bellonte's Breguet "Question Mark," Paris-New York airplane



Capt Courtney's Dornier in which a trans-Atlantic flight was attempted

tander, Spain, on their flight to Rome; time 31:30:00. Rome was reached on the 10th.

67. July 10. Capt. Albin Ahrenberg, Lt. Axel Floden and Robert Ljungland in the Sverige [Junkers monoplane] from Reykjavík to Ivigtut. Left Stockholm June 9, with stop at Bergen.

68. July 13. Maj. Casimir Kubala and Maj. Louis Idzikowski in the Pilsudski (Amiot-Lorraine 650 land biplane) from Paris to Horta, Azores, on way to New York. Engine trouble caused descent which ended in death of Idzikowski.

69. July 13. Capt. Dieudonne Costes and Lt. Maurice Bellonte in the Question Mark (Breguet-Hispano 600 land biplane) from Paris to within 120 miles of Azores where they turned back to Paris. In the air about 28 hours.

70. Aug. 1-4. Airship Graf Zeppelin with crew of 42 and 19 passengers from Friedrichshafen to Lakehurst, N. J., in 93:23:00. Dr Eckener commanding.

71. Aug 8-10. Return trip of airship Graf Zeppelin to Friedrichshafen in 55 hours, beginning of world circuit.

72. Aug. 19. Kaeser and Lucher from Lisbon. Lost after having flown over the Azores.

73. Sept. 1-4. Graf Zeppelin left Lakehurst for Friedrichshafen with crew of 42 and 17 passengers, commanded by Ernest A. Lehmann, completing in 66 hours this last stage of FIRST WORLD AIRSHIP CIRCUIT.

74. Oct. 22. Urban F. Diteman (Barling-Warner 110 open land mono-

plane) from Harbor Grace, N. F. Lost at sea.

75. Dec. 15-16. Challé and Larre-Borges (Breguet Bidon-Lorraine 450 land monoplane) from Seville to Maracuza near Natal. Plane damaged in landing at night.

#### 1930

76. May 12-13. **Jean Mermoz, Dabry and Gimié** (Latécoère 28-Hispano 600 cabin seaplane) from St. Louis, Senegal, Africa, to Natal, Brazil, in 20:15:00.

77. May 20-22. Graf Zeppelin crossed South Atlantic en route to Lakehurst, N. J., from Seville to Pernambuco, 3659 air line miles in 48:15:00. Left Friedrichshafen May 18. Arrived Lakehurst, May 31. Distance of trip 12,144 miles.

78. June 3-6. **Graf Zeppelin** returned to Friedrichshafen, completing round trip in 19 days 2 hours: 298 hours flying time

79. June 23-24. Sqdn. Leader C. Kingsford Smith, Evert Van Dyck, Capt. J. P. Saul and J. W. Stannage in the Southern Cross (Fokker VII, 3 Wright cabin land monoplane) from Port Marnock, Ireland, to Harbor Grace in 30:28:409; thence to New York on June 25.

80. July 9. Mermoz, Dabry and Gimié (Latécoère 28-Hispano 600 cabin seaplane) alighted in sea 360 miles short of St. Louis, Senegal, Africa, in return flight from Natal. Rescued by ship.

81. July 29-Aug. 1. Sqdn. Ldr. R. S. Booth, Wing Comdr. R. B. B. Col-

more, Maj. G. H. Scott, Sir C. D. Burney and 40 of crew in British airship R-100 (6 Rolls Condor III B) from Cardington, Eng., to Montreal, Can., in 78:52:00.

82. Aug. 14-16. Return trip of R-100, in 56:12:00.

83. Aug. 19-26. Capt. Wolfgang von Gronau, Edw. Zimmer, Franz Hack, Fritz Albrecht (Dornier Wal, 2 BMW 500 monoplane flying boat) from Warnemünde, Germany, to New York, with stops at Faroes, Reykjavik, Ivigtut; Cartwright, Labrador; Queensport, N. S.; and Halifax, in 47:00:00 flying time. 84. Sept. 1-2. Capt. Dieudonne Cos-

84. Sept. 1-2. Capt. Dieudonne Cosses and Lt. Maurice Bellonte in the Question Mark (Breguet-Hispano 600 land biplane) from Paris to New York, 3610 miles in 37:17:00. Subsequently they toured the United States covering some 15,000 more miles.

85. Oct. 9-10. Capt. J. Errol Boyd and Lt. H. P. Conner in the Columbia (Bellanca-Wright 200 cabin land monoplane) from Harbor Grace to Tresco, Scilly Isls., Eng., 2260 miles in 23:44:00.

#### 1931

86-99. Dec. 16-Jan. 6, 1931. General Italo Balbo and 43 companions in a group of 11 planes (Savoia 55, 2 Fiat 550 monoplane flying boats) from Bolama, Portuguese Guinea, to Natal, Brazil, in a flight from Rome with stops at Las Alcazares, Kenitra, Villa Cisneros. Subsequently the trip was continued to Rio de Janeiro. Three other planes failed to complete the cross-water stage.

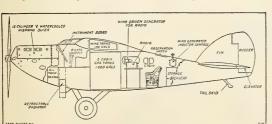
100. May 1-3. Capt. Albin Ahrenberg (Junkers open sea monoplane) from Bergen to Angmagsalik, Greenland, 1375 miles, with intermediate stops at Thorshavn and Reykjavik.

101. May 8-June 5. Capt. Friedrich Christiansen and party in the Dornier X (Dornier X, 12 Curtiss 600 monoplane flying boat) from Bolama, Portuguese Guinea, to Natal, Brazil, in course of flight which started at Altenrhein, Switzerland, Nov. 5, 1930.

102. June 23-4. Wiley Post and Harold Gatty in the Winnie Mae (Lockheed Vega-P. & W. 550) from Harbor Grace to Chester, Eng., in the second stage of their FIRST ROUND WORLD AIRPLANE FLIGHT. The flight was completed at New York on July 1, the fliers having covered a distance of 15,474 miles in eight days, fifteen hours and fifty-one minutes.

103. June 24-5. Holgar Hoiriis and Otto Hillig in the Liberty. (Bellanca Pacemaker-Wright 300 cabin land monoplane) from Harbor Grace to Krefeld, Germany, in 32:00:00, continuing to Copenhagen on June 26, from New York.

104. July 15-16. Capt. George Endres and Alexander Magyar in the Justice for Hungary (Lockheed Sirius-P. & W. 420 open land monoplane) from (Continued on page 50)



The "Yellow Bird" which was flown from Maine to Spain

AERO DIGEST

# EDITORIALS



Photo by U. S. Army Air Corps.

### GENERAL FECHET JOINS AERO DIGEST

AJOR GENERAL JAMES E. FECHET will retire as Chief of the Army Air Corps during December and on January first will join AERO DIGEST as its National Defense Editor. He will direct the activities of the AERO DIGEST Bureau, Washington, D. C., with offices at the National Press Building, 14th and F Streets. This Bureau will be devoted to organizing every available means for the enlightenment of public officials as to the importance of aeronautical development as a necessity to national defense and national progress.

The industry has needed such a Washington Bureau for years and in supplying it AERO DIGEST is pursuing its steadfast policy of doing its utmost to lend cooperation. The services of this Bureau will be available to everyone connected with American aeronautics. For the use and information of members of the House and Senate, the Bureau will have available at all times data relating to the aeronautical industry's problems regarding which Congressmen and Senators have not always found it convenient to get facts quickly.

General Fechet's desire to serve the best interests of his country are to have newly emphatic expression after his retirement from active service as an officer of the United States Army Air Corps. To have associated with it so eminent and so capable a man as General Fechet is indeed a fortunate condition, not only for Aero Digest, but also for the industry it represents.

### OUR NEW CHIEF

URING December, Brigadier General Benjamin D Foulois will become Major General and Chief of the Air Corps. This is one of the rare occasions in official Washington life when merit gets the reward it has earned. Foulois has the whole Army Air Corps solidly behind him from the Randolph Field cadets up, and he has the good will not only of the services, but of the whole aircraft industry. Give Major General Foulois the appropriations and before the expiration of his four-year tour we will have the greatest air force in the world.

### LET'S HAVE AIRCRAFT CARRIERS

N line with President Hoover's economy program, one branch of the Navy can be built in full accordance with the Five Year Program as laid down at last year's Disarmament Conference in London. That allowed to the United States an increase of 80,000 tons of aircraft carriers. It may not be amiss to call this to the attention of Admiral W. B. Pratt, Chief of Naval Operations.

The Admiral should bear in mind that if this building is not done before the 1935 Conference, it undoubtedly will be lessened or nullified in accordance with the general movement to disarm the world and invite disaster.

December tenth of last year, Admiral Pratt testified before the Committee on Naval Affairs: "The problem which we now face is how to get the most efficient ships from the tonnage allowed."

A conference with Admiral Moffett and Secretary Ingalls would enlighten him upon this subject. If a start upon this program is made in 1932 the tonnage allowed can be completed before the next Conference.

The light cruiser with flying deck is foreordained to be the most efficient weapon in the next great naval engage-

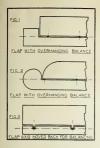
### ORGANIZE TO HELP

PILOTS have the same God-given rights which are guaranteed to other citizens by the constitution and most of the by-laws of the United States, but there are also rules of common sense. When, if and as pilots organize (and to their organization there should not be the least objection), they should do so with the thought of helping the industry.

Steady income-bearing jobs in these days are not the easiest things in the world to find. Moreover, it is traditional that the man who once has known the privilege of sitting at the controls of a scheduled ship, putting her through whatever may oppose him, is not likely to be sleepily content amidst the humdrum which must satisfy the earthbound.

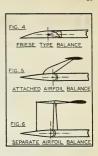
In these days it will be well for pilots to think carefully about schemes and organizations promoted by outsiders for selfish profit, the indirect if not avowed object of which must be the creation of hostility and the adding of handicaps to the efforts of men who have striven earnestly, honestly and very fairly to keep planes in the air and who are developing the industry through difficult times at the risk of their own and other people's money.

A question for pilots to ask themselves when approached by the wily walking delegate might be: "Why should we try to harm the source of our income?"



# **MEANS FOR** INCREASING THE LIFT

## Dr. Max M. Munk's Eighteenth Article on the Principles of Aerodynamics



LAPS are the simplest means for decreasing and increasing the lift of airfoils and are universally employed for the control of airplanes. For that reason alone they deserve a somewhat detailed discussion.

Surfaces with flaps turned up or down constitute airfoils with wing sections of a special form. The mean camber line has a break. Turning the flap up or down changes the wing section and the angle of attack. It changes in particular the absolute angle of attack, that is, the angle of attack measured from the position of zero lift. This angle can be computed with flap sections by means of ordinary wing section theory, at least for small displacements of the flap, representing small cambers for which the theory is made.

Without any computation it can at once be concluded from the theory that the change of the absolute angle of attack is independent of its original value and of the original shape of the mean camber line. The flap effect depends on the flap size and the flap displacement only, and is the same for straight fixed surfaces, as well as for conventionally curved ones. The action of ailerons and of elevators is therefore similar. This follows from the principle that the deflecting effects of all elements of the wing sections can be added. The change of the air deflection is equal to the deflection produced by the change of the shape or position. The change of the absolute angle of attack can therefore be written in the form

 $\triangle \varpropto_a = K\Omega$  where  $\Omega$  represents the angle of displacement of the flap and K is a quantity depending on the ratio of the flap chord t to the entire chord c. The theoretical computations give a value for K that can be approximated for small chord ratios t/c by  $K = \sqrt[3]{t/c}$  or, following Diehl, by K = 1.90 - 0.57 t/c. It should be noticed that this relation is entirely independent of the aspect ratio and of the aerodynamic induction. K is the ratio of the equivalent angle of attack to the flap displacement; the resultant lift coefficient is again decreased from its theoretical value according to the aspect ratio.

The two approximate equations for K show that the flaps are comparatively more effective when they are small. This too was to be expected from theory, because the wing elements are comparatively most effective near the trailing edge. The effect of turning the flaps is always smaller than that of turning the entire airfoil by the same angle. Per unit area of the flap, however, the effect is always greater in the case of the elevators. For very small flap chords theoretically it approaches infinite, but practically it will

hardly ever be larger than two. The fixed area in front of the flap then doubles the lift produced by turning the flap

With large angles of deflection, the lift realized becomes smaller than given by the use of the foregoing expressions for the absolute angle of attack. The difference is taken care of approximately by subtracting a term from the theoretical K proportional to the chord ratio and to the displacement angle  $\Omega$ . Diehl proposes 0.014  $\Omega$  t/c for this term. The approximate expression for the ratio of the change of the absolute angle of attack of the entire airfoil combination to the change of the displacement of the flap is then

 $K_1 = K - 0.014\Omega_0$ 

$$K_1 = 1.90 - 0.51 \text{ t/c} - 0.014\Omega_0$$

The center of pressure of the lift produced by turning the flap down is also in keeping with the ordinary theory. It is largely in front of the flap, in the fixed portion, or stabilizer. The action of the flap is therefore seen to be indirect. The turning down of the flap causes a lift chiefly in front of it, acting on the fixed surface. The flap affects the airflow but it does not take the lift, or most of it, itself: It causes lift, but does not lift itself. This is an advantage, because the hinge moments of the flaps become much smaller in consequence of it. The flaps and their hinges would have to be made very heavy if they were to take all the lift they produce. The control forces would become excessive. Even as it is, the control forces become generally too large, and the hinge moments have to be reduced by balancing. The flaps are modified; they are made to hang over and to extend ahead of the hinge line in different ways. Simple overhang is shown in the sketches fig. 1 and

Another method of accomplishing a similar effect is shown in fig. 3 where the balanced portion extends to the front of the hinge line along the entire span. A relatively modern way of improving the last arrangement refers to the special wing section used, somewhat like fig. 4. This Friese type balance is chiefly used for ailerons. The drag of the aileron turned up is increased and the flight properties of the airplane improved thereby.

It is also possible, and found in practice, to balance a flap by separate balancing airfoils, as in fig. 5, or less frequently, as in fig. 6.

The balance of the rudder can be computed approximately by assuming a constant pressure to act at 20 per cent of (Continued on page 97)

# HISTORY and COMMERCIAL VALUE of the

# AIRPLANE LAUNCHING CATAPULT

By R. W. Cuthill and H. S. Hinchman

EVELOPMENT of the modern catapult has been almost contemporaneous with the advent of the airplane. On May 6, 1896, Professor Samuel P. Langley launched a thirty-six-pound automatically controlled airplane from a barge on the Potomac River near Quantico, but the man-carrying plane which he built later was never successfully flown until many years after his death. Hiram Maxim, the machine-gun inventor, built a three-man plane which traveled at wonderful speed along a pair of widely spaced rails, but he never ventured to take it off the ground. In the meantime, the Wright brothers were developing their idea of a flying machine, and in December, 1903, Orville Wright actually succeeded in launching a man-carrying plane by means of a catapulting device at the old Kitty Hawk shot tower.

His plane was equipped with a gasoline motor and propeller, and additional momentum was attained by running down an inclined monorail. Two side rails stabilized the plane against lateral movements. By means of a trigger release the plane started off under the double acceleration

of its engine power and gravity. From these crude experiments were developed airplanes of sufficient tactical value for both the Army and Navy. This was very evident a few years later during the World War. In November of 1911. Eugene Ely succeed in flying a landplane from a temporary platform constructed on the forward deck of the U.S.S. Birmingham, which was stationed at Hampton Roads, Virginia. This appears to have been the first demonstration of the ability of an airplane to fly from the deck of a ship. It is always necessary, however, to distinguish between what is possible as a stunt and what can be adopted as regular practice. In flying off a deck it is usually necessary for a ship to change its

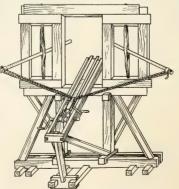
T HIS article is a resumé of the de-velopment of the airplane launching catapult, as perfected in the United States, and considers the possibility of its application as an adjunct to commercial aviation. Necessity is the forerunner of invention, and, in the authors' opinion, the need to have air transportation facilities as conveniently located as railroad and hus stations will ultimately result in providing air depots right in the business centers of all large cities. As soon as air transportation is accepted as being safe and reliable, there will be an insistent demand for air terminals within easy reach of prospective passengers. These facilities will be absolutely necessary for those who can afford to travel to and from business by air and live within a suburban area extending to a radius of a hundred and fifty miles from the centers of our large cities.

course so as to head into the wind. This maneuver might have serious consequences for ships in battle formation, and would at least cause delay. However, the Navy Department realized the imperative necessity of having airplanes with the fleets, both for offense and defense, particularly for scouting and bombing. In fact, the very existence and practical value of all naval vessels began to be questioned when the formidable possibilities of an aerial bombing attack were realized. The experiments were therefore continued with a view to developing methods of operating airplanes from ships. Ultimately, in the Naval Bill for 1911-1912, there was included the first appropriation of \$25,000 for aeronautical development work. As progress was made, larger appropriations were obtained each successive year.

Captain Washington I. Chambers, who was assigned to naval aviation development duty, conceived the idea of using a catapult to launch airplanes at flying speed from a ship's deck. He was assisted by Lieutenant T. G. Ellyson, who was the Navy's first aviator, and Captain H. C. Richardson, who is now vice-presi-

dent of the Great Lakes Aircraft Corporation, and several other naval officers and civilian personnel. There was no such thing as a modern catapult, and the ancient variety was absolutely useless. No data or formulas of even the most empirical nature were available as a basis for the design, and one guess seemed as good as another. In this dilemma, it was finally decided to take the bull by the horns, use the known weight and stalling speed of a given plane, and adopt liberal assumptions for all unknown quantities.

Among the many decisions to be made was first the choice of power to be used. As compressed air up to 2,000 pounds per square inch was available on most naval vessels, this power was decided



Type of catapult used by Philip of Macedon at the siege of Byzantium in the year 340

to be the most practicable and economical to use. The next and most difficult problem was to decide at what rate the human body could be accelerated without injury or loss of functions. This was necessary in order to keep the length of the catapult to a minimum, in order not to occupy too much deck space. Scientific information available indicated that an acceleration of 5g. (5 x 32.16  $\pm$  160.8 feet per second) was possible without physical incapacitation, but finally it was computed that an acceleration of 2.5g or eighty feet per second would be sufficient, and could be attained on a catapult of permissible dimensions.

In due course this catapult was designed and completed. It consisted of a structural steel frame supporting two steel tracks, along which a small wooden carriage was pulled by means of wire rope actuated by an air engine. The airplane was supported on this carriage and was automatically released at the end of the run.

As might have been expected with something which had never been attempted before, this catapult was not at first very satisfactory. However, numerous tests were conducted, mistakes corrected, improvements developed, and much valuable data accumulated. During these experiments only dummy loads were shot from the catapult, but after everything seemed to be working smoothly, it was decided to make some live shots. Lieutenant Ellyson made two trial flights and earned the credit of being the first man to be launched in a plane from a catapult. This auspicious event inaugurated a new development in naval operations.

A shortage of funds, and to some extent, a lack of appreciation of its possibilities, prevented further catapult development until 1915, in the early days of the World War. About this time a larger catapult of superior design was constructed under the supervision of Captain H. C. Richardson and installed on the U. S. S. North Carolina. Shortly afterward it was removed and replaced by another catapult incorporating some more improvements. From this catapult many successful launchings were made. Following in close succession, catapults were installed on the cruisers Huntinaton and Seattle.

When the United States entered the World War, guns were considered of more importance than catapults, and orders were issued to remove them from all ships to which



Vought plane ready for launching at sea



Vought seaplane leaving the catapult on a battleship

they had been assigned. During the period from 1917 to 1918, catapults were completely eclipsed by the paramount problems of these critical years of the war.

Shortly after peace had been declared, Lieutenant William M. Fellers, a Naval Officer of considerable mechanical inventive ability, was assigned to engineering duty in charge of catapult design and construction at the Naval Aircraft Factory, Philadelphia. The first project to be undertaken was a specially designed catapult suitable for installation on the U. S. S. Langley, which ship was the Navy's first aircraft carrier equipped with a flying-off deck. This necessitated considerable engineering ingenuity because one of the new requirements specified that the launching car which supported the plane be stopped at the end of the accelerated run. On all previous catapults this car had been shot overboard and retrieved by an attached cable; but to stop within four or five feet without damage a heavy car traveling at sixty miles per hour would be an accomplishment never before contemplated. After many computations and experiments, a suitable brake for stopping the car was developed. The catapult itself in due course was designed, and two of them were manufactured and built into the ship's structure. These catapults continued in active operation for many years; in fact, one of them is still in usable condition today.

The next conception was the turntable type of catapult. This departure permitted the catapult to be trained in any direction into the wind independent of the course of the ship, and facilitated airplane operation without interference with other naval maneuvers.

During the next ten years, catapults were developed under the personal supervision of Lieutenants Carl B. Harper, Lisle J. Maxson and Lucien M. Grant. In addition to compressed air, gunpowder and electricity were employed as motive power, and the efficiency and capacity of the catapults were greatly increased.

Catapults are now regular equipment on all battleships, cruisers and carriers, and the efficiency of the Fleet is thus greatly increased.

Foreign nations have followed the United States' lead and developed various types of catapults for both landand seaplanes. Great Britain, Germany, France, Italy and Russia are using catapults for either military or commercial purposes.

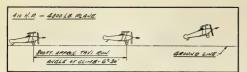


Fig. 3. Diagram illustrating taxi run on a flying field

Since catapults have been accepted as permanent equipment on naval vessels, their commercial possibilities have begun to attract serious attention. Ship-to-shore service from Atlantic liners would save about a day's time in the length of the voyage and would considerably speed up the trans-Atlantic mail service. By using catapults and amphibion planes, communication could be maintained between ships and many places along the South American and African coasts where harbor facilities are not available or where business does not yet warrant a steamship to stop. These amphibion planes could take passengers, express packages and mail ashore and return to the ship with a similar payload without delaying the ship in any way.

The large number of people who travel by air for business and pleasure indicates that the public is becoming more airminded. During 1930, according to Department of Commerce statistics, over 375,000 people traveled on regularly scheduled airlines financed and operated in the United States. In 1931, an increase to 500,000 passengers is estimated. Several million pounds of mail and freight were also carried.

Aircraft operation is a steadily expanding business, repre-

senting millions of dollars in investments. Profits have not entirely met all expectations, but these are sure to be realized by efficient business methods and the return of more prosperous times.

The French and Germans are promoting ship to shore air transportation by installing catapults on their trans-Atlantic liners. The French liner Ile de France and the German liners Europa and Bremen are equipped with catapults for regular mail and passenger service from ship to shore. The catapults and airplane handling equipment on these ships are permanently incorporated in their construction and were included in the shipbuilder's design. This indicates that the operating company had considerable confidence in catapults to consider them both a necessary and a profitable investment. Great Britain is building a large transport liner which will have a catapult as standard equipment.

The plans of the new passenger liners sponsored by the United States Shipping Board do not at present include catapult equipment; but the necessary accommodation should be reserved so that they can be easily installed later. Before these ships are completed it may be necessary, in order to meet foreign competition and Government mail contracts, to incorporate specially designed catapults. This would permit these

ships to coördinate the air and marine mail transportation independent of railroad or other carriers. Any necessary customs regulations can be complied with as easily at an airport as at a seaport. When the *Graf Zeppelin* landed at Lakehurst, the Customs officials attended to their duties with regular formality.

There are no financial statements available relative to the costs and profits of the German and French ship-to-shore service. With mail contracts and efficient operation, however, this

service should be quite profitable. Contracts and patronage will not be lacking where the service satisfactorily meets requirements.

Late in 1927, rather hurried preparations were made for inaugurating ship-to-shore airplane service from vessels of the United States lines. Arrangements were made to utilize catapults and all other necessary equipment from the Navy Department, but the whole scheme was abandoned. They did, however, succeed in equipping the Leviathan with a temporary platform from which, in August of that year, Clarence Chamberlain made the first successful flight from a passenger ship to the shore. This, of course, did not prove anything new, as a similar stunt had been performed before from the deck of a battleship by Eugene Ely.

In the summer of 1928, the French commenced their experimental ship-to-shore service from the Atlantic liner Ile de France. Several successful flights were made without serious consequences, although one of the seaplanes made a forced landing in the English Channel and was towed to port. The following year the Germans inaugurated a similar service on the North German Lloyd Line.

If regular ship-to-shore service were put into operation for several months, and used especially for air mail and express delivery, it would soon attract public attention. Then it could gradually be extended to include passenger service as is now being done by the German lines. Anything which will speed up the activities of our daily life is acceptable and desirable, but to be a permanent success "Safety First" must be its sine gua non.

The continuous improvements in airplane design are important factors contributing to the feasibility of ship-to-shore service. The trend toward all-metal construction for seaplanes increases strength and seaworthiness without much increase in weight.

Then, again, the more powerful and lighter air-cooled engines have greatly increased the flying range and speed



Proposed Philadelphia Custom House with roof designed to be used as a landing field

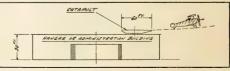


Fig. 2. Short run required from an airport catapult

of airplanes. If a plane, flying at 150 miles per hour, was catapulted from a ship 600 miles from port, it could easily land its passengers a day before the ship docked; and, at the landing field, there would be other planes by which the journey could be continued without delay.

In fact, it may be stated with assurance that the time has arrived for organizing ship to shore service on a

business basis. Exclusive of operating expenses, the complete outfit could be installed on a passenger ship at a cost of approximately \$75,000. This equipment would consist of a 6,000-pound sapalane, a sixty-five foot catapult, and a 1,200-pound capacity air-compressor. The only trained personnel required would be the pilot and the catapult operator and even the latter could be dispensed with by providing an automatic release. All other work could be performed by members of the ship's crew accustomed to operating deck machinery.

There is another field for catapult operation which has not received the consideration it is entitled to, and that is operation from large buildings and small flying fields.

The new aircraft carriers being authorized by the Government will be much smaller than the U. S. S. Saratoga and the U. S. S. Lexington because it has been found that the 100-by-900-foot decks of these ships are larger than necessary for taking off or for making a safe landing. Therefore, it seems evident that if all airplanes were provided with wheel-brakes (ultimately this will be compulsory) and if flying fields were equipped with arresting gear and catapults, there would be no necessity for finding large tracts of level ground for flying fields; a space about two city blocks square would be sufficient.

A flying field can be dangerous if the entire surface is not kept in good condition. Besides the discomforts of traveling over a rough or dusty field, there are always the attendant dangers of traversing muddy, sandy, and uneven ground at high speed. These dangers could be avoided by having a small, smoothly surfaced field equipped with hydraulic arresting gear and catapults. All rough riding would be eliminated because the catapult would launch the plane into the air with one strong, steady push, and the



International photo

Land airplane in England being catapulted into the air

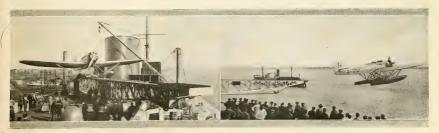
arresting mechanism would gradually bring it to a stop by regulated retardation.

The Department of Commerce's requirement for a first class airport specifies four runways 500 feet wide by 2,500 feet long, providing eight directions of flight. This is indicated by the heavy lines on Fig. 1. The total flying field area would be 160 acres. Unimproved ground adjacent to large cities is cheap

at from \$500 to \$1,000 per acre. Therefore, without any improvements, this field would cost between \$80,000 and \$160,000.

By limiting the initial cost, the carrying charges would be comparatively smaller. This can be accomplished by using a thirty-three-acre flying field about 1,200 feet square, as shown by dotted lines in Fig. 1, smoothly surfaced all over, and with the height of adjacent buildings controlled by zoning. A circular or rectangular building located at the center of this field could house all the flying field activities, such as general offices, waiting rooms, restaurant, catapult air-compressor room, shipping department, and pneumatic tube station for despatching mail and express packages to the central city offices. This operation building should be approached by an underground vehicular and pedestrian passage, and it would be better still if it could be located over a rapid transit subway station, thus providing transportation to the business district for airway commuters. The roof of this building would be used as a catapult platform for despatching airplanes. One or more catapults could be installed as necessary, and the airplanes would be raised to the catapult deck by elevator. See Fig. 2.

Airplanes arriving at this Tom Thumb field would land in any direction, heading into the wind and passing to the right of the operation building if it is necessary to travel that far before being stopped by the brakes. Planes without brakes should have trailing hooks to engage the hydraulic arresting gear provided over a central section of the field. Arresting gear, however, will only be a temporary requirement until airplane brake equipment is compulsory. All these small fields should be of a standardized design, and as nearly identical as possible, so that all regu-



Heinkel seaplane and catapult aboard the North German Lloyd trans-Atlantic liner "Bremen"

lar pilots would soon become adept at using them. Suitable barriers, such as used on the carriers, should be erected around the field to stop, without serious damage, any plane which failed to come to a stop within the space provided.

This type of field could be economically flood-lighted from a tower on the central building. A beacon light from the same tower would serve as a guide for night fliers and there is no reason why the beacon lights should not be of different colors to identify the various fields in the same locality. In the daytime this tower would display the various weather and wind signals necessary for the fliers' information.

Coming back to the question of operating airplanes from the roofs of large buildings and keeping within the bounds of what at present seems practicable, the first consideration should be the safety of the public in the adjacent streets and buildings. Therefore, airplanes should not be operated from the roofs of high buildings over nearby smaller buildings or over traffic thoroughfares. The most suitable

buildings would be those situated near open fields, parks, water-fronts and cemetaries. The roofs of railroad and marine terminals could be made into convenient airway stations, as the area available is usually more than sufficient. The equipment of such a roof station would duplicate as far as necessary the proposed small field already described. It is recommended that the roofs of the new post offices, such as the one being built at Philadelphia, be suitably equipped with catapults and arresting gear for the operation of air mail planes.

The principal consideration determining the size of flying fields is the length of run required by a plane before it leaves the ground and its angle of climb. Take an aver-

age plane weighing approximately 4800 pounds with an angle of climb of six degrees and thirty minutes. If it takes off from the ground as shown in Figure 3, it will travel 800 feet before it begins to rise. Assuming that the effect of the wind is negligible, this plane will have attained an altitude of about forty-five feet when it crosses the boundary of a 1,200-foot field. If this same plane were launched from a catapult located on top of a hangar thirty feet high or on an administration building, as shown on Figure 2, it would have to travel only a total distance of about 200 feet to attain the same altitude.

The public has had very few opportunities to become familiar with catapults; in fact, many people have no idea what they are. Even Graham MacNamee has humorously remarked that when he first heard of catapults he thought they were some kind of fruit like a cantaloupe. When catapults become better known, however, their many advantages will be more fully appreciated, and they will be accepted as a necessary adjunct to every well-equipped flying field. It deserves the serious consideration of all airplane operating companies conducted on a sound and profitable basis.

If catapults had been adopted for commercial use several years ago the excessive size of present day airports could have been avoided and the expenditure of millions of dollars of useful funds avoided. Probably most cities could have had their airports much more conveniently located, instead of five to fifteen miles away, as most of them are at present.

Ship-to-shore service should also have been inaugurated several years ago. But better late than never. The handling of airplanes at sea is a little more difficult. Naval vessels use a special airplane crane for lifting planes, but an ordinary cargo boom and deck winch are quite serviceable. The same crane or boom is used to lift the plane from the water back on board ship when necessary.

A question that is frequently asked by those who have just witnesed a catapult launching is whether the stresses to which a plane is subjected when being catapulted neces-

sitate extensive reinforcing and cause any appreciable increase in weight. The only parts necessary to strengthen are in the locality of the three fittings which support the times gravity.

plane on the car, and the diference in weight is unimportant. The regular factors of safety used in airplane design are ample for all catapulting stresses. In fact, the stresses to which is a plane is subjected when stunting are much more severe than when it is catapulated. During diving starts with engine wide open. or in a tight spiral, planes frequently attain an acceleration equivalent to four times that of gravity, whereas a catapult

launching is only about two The catapult itself, of course, is the most important

item of equipment, as successful operation depends ultimately on its absolute dependability. Catapults can be manufactured for from \$15,000 to \$25,000, according to launching capacity, quality of materials, workmanship, inspection standards, specification requirements and miscellaneous equipment. But, regardless of all these important considerations, catapults must be designed by engineers sufficiently conversant with such mechanisms as to insure their safe and efficient operation without the wasting of time and money on experimental development. Success or failure depends entirely on the proper proportions and physical properties of metallic structure and the synchronization of mechanical movements. Everything must occur in coordinated sequence. Although the complete operation culminates in the twinkling of an eye, a slow motion picture reveals a complete cycle of operations under perfect control.

A mechanic of average experience is fully qualified to operate and care for a catapult. Only ordinary cleaning, (Continued on page 98)

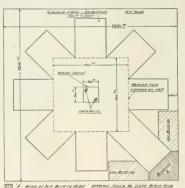


Fig. 1. Airport layout, minimum for No. 1 rating

# PITTSBURGH CITY-COUNTY AIRPORT

OUR MILLION cubic yards of dirt, rock, mud and gravel.

Three and one-half million dol-

Six hundred and ninety acres. Big figures, those, that spell the victory of money, brains and labor over natural obstacles that have been conquered in building the new Pittsburgh, Pa., City-County Airport and insuring Pitts-

burgh's future in aviation.

Men have literally moved mountains and filled valleys to give actual substance to the seven-year-old dream of an airport that nationally-known fliers and engineers have said will be second to none in the entire country.

Brains, brawn and money have labored there side by side wresting the huge, level area from the grasp of nature so that Pittsburgh would be able to assume her rightful place as a national aviation center. And man and his machines, working day and night, summer and winter, have been victorious.

The almost super-human task that has been done was evident to the visitors at the airport opening ceremonies September 11th. Among other "items" at the new port, they found:

Actual flying field area of approximately 484,000 square yards, all hard surfaced, the equivalent of nearly 50 miles of 18 foot highway.

Paved area other than flying area, 50,-000 square yards.

A gasoline storage and distribution system that includes four 15,000-gallon underground tanks supplying fuel through pipe lines to eight fueling pits located at salient points about the field.

A drainage plan involving the placement of approximately 7,000 feet of conciete troughs and 9,000 feet of corrugated metal drain pipes.

An administration building, nearing completion and scheduled to be completed about October 1st.

A huge hangar, conforming in design to the administration building, including an open area approximately 113 by 105 feet.

An auxiliary building, designed to accommodate all facilities auxiliary to operation of the port and buildings.

Three public rest rooms, an oil house and a gasoline pump house.

The administration building, planned after a comprehensive study by County Commissioners and engineers of the Public Works Department, is said to be unique in airport building construction. It is of structural steel with brick exterior walls, mounted on concrete foundations and especially designed for the purpose for which it is to be employed.

By

# Charles P. Johnson

Actually it is a close approximation of a railroad terminal, although necessarily on a smaller scale. The first floor, slightly above the field level, includes a large vestibule and waiting room, ticket offices, mail rooms, rest rooms, hospital rooms, offices and baggage rooms.

On the second floor are the offices of



Arrow of marker points true north

Manager Carl W. Forcier and his assistants, radio room, five other office rooms, dormitories for men and women pilots, weather bureau room and press

Mounted above the second floor on the roof is a control tower, so arranged that its operator can see in all directions. It is from this room that men skilled in their particular fields will direct incoming and outgoing traffic and operate by button or switch the port lighting system and other electrical equipment. The building includes 11,600 square feet of floor space.

Unseen by the throng that attended the opening ceremonies, except in results finally obtained, were the seven years of planning, studying, building that have resulted in the port as it stands.

Early 1924, Joseph G. Armstrong, chairman of the Board of County Commissioners, awakened to the need of such an airport, realizing the benefit that would accrue to the district through aviation development. Such an undertaking as has now been completed was dreamed of at that time, but it took the passage of the years and the rapid growth of aviation to stress the actual need of a large, complete airport.

Rodgers Airport, near Aspinwall, was chosen as adequate to the purpose at that time, and was completed in June, 1925. The site did not by any means meet the original requirements, but it was accepted with the idea of developing a preliminary airport so that conditions surrounding the construction might be helpful in the greater plan that all knew would have to be undertaken

Rodgers Airport today, headquarters of several commercial aviation concerns and of military flying in the district, will be retained as an auxiliary or emergency landing field, fitting in closely with the Commissioners' idea of district development and serving its purpose as a valuable adjunct to the new port.

The Commissioners' original idea of constructing an airport that would be equal to any in the country and to the best European ports was not allowed to lapse. As the years passed, the idea was enlarged upon. An organization was prepared under the Department of Public Works to study the airport situation as it affected the district, the state and the country.

Various sites in the district were considered and studied. The economic consideration of cut and fill, elevation, accessibility, highways, rail transportation, future expansion, all tended to make the already intricate problem more complex. Cooperation with the works department in this task were the County Planning Commission, officials of the U. S. Department of Commerce, the Pittsburgh Chammerce and the Aero Club of Pittsburgh.

In June of 1928 county citizens voted \$1,500,000 for the purpose of acquiring by lease, purchase or condemnation proceedings land within the county limits. for the purpose of establishing an airport. Late in July of that year Walter O. Snyder, Jr., of the Aeronautics Branch, Department of Commerce, went to Pittsburgh at the request of A. E. Braun of the Chamber of Commerce Airport Committee, and studied nine different sites. He reported favorably on the Lebanon Church Road site, Later A. P. Taliafero, Jr., of the Aeronautics Branch reported that, in his opinion also, that site offered the best possibilities. The County Planning Commission and the Chamber of Commerce likewise recommended it.

Commissioners approved the site October 8, 1928, and the project was placed in the hands of engineers of the County Department of Public Works. All of the study plans were prepared, to enable actual preparation of contract plans, specification, advertising the work for proposals, and finally actual letting of the contracts. The plan was developed and built into a relief model, primarily for the guidance of engineers and education of the public.

The many phases of engineering and construction involved included grading and surfacing of the flying field area and other area, construction of storm water drainage systems, erection of buildings, construction of underground conduit system, installation of water, gas and electric service to the port, extension of the water mains from McKeesport Boulevard to the eastern boundary, construction of storm sewers, installation of gasoline storage and distribution system, of lighting and other electrical work, sanitary sewers and septic tanks, field markers; installation of telephone and telegraph service, and of power and light cables from Lebanon Church Road to the administration building,

Provisions had to be made for a fire alarm and call system, telephone exchange, radio and public address system, and for equipping and furnishing the buildings. Property acquisitions, as of June 1st, totalled more than 690 acres.

The contract for grading and drainage, involving an almost unbelievable amount of work because of topographical conditions, was awarded to the Vang Construction Company July 12, 1929, and was finished in August, 1930, with the exception of a small area delayed by

legal proceedings until February, 1931. The grading contract established more than 250 acres of level land at an elevation of 1,250 feet, of which area more than 150 acres is being developed for flying field and the rest for commercial and parking purposes.

The contract involved destruction of the tops of three hills and leveling of the valleys, so that all told more than 650 acres of the available property has been established. In the immediate vicinity 350 to 400 more acres could be acquired in the event future development proved it necessary.

Of especial interest, although not apparent to the casual observer, is the gasoline storage and distribution system. This part of the airport equipment embraces a complete system for distribution of both auto and aviation gasoline, allowing the county to purchase fuel in carload lots and by means of pumps and pipe lines store this gasoline in four 15,000-gallon tanks. From the storage tanks fuel is conveyed to eight fueling pits, which are of the latest design.

The contract for lighting the airport and installing miscellaneous electrical equipment embraced installation of flood lights, boundary lights, obstruction lights and other lighting equipment to conform to standards set by the Aeronautics Branch, Department of Commerce, and the State Aeronautics Commission. The contract includes the extension of power and lighting facilities to airport buildings.

A large rotating beacon and a flash code beacon will be located at the foot of the control tower. Three banks of incandescent flood lights will illuminate the flying area by night. Cone-type boundary lights surround the field. Two illuminated wind cones and an illuminated wind "T" will enable night fliers to land correctly. A large electrical sight reading "Pittsburgh" spelled in neon letters, is to be installed. Projector lights will play on all buildings. Obstacle lights prescribed by the Commerce Department will help airmen in spotting those buildings from the air.

The drainage system includes concrete troughs flush with the flying field surface, so placed as to quickly collect and remove storm water. Openings of the troughs are covered with malleable cast iron gratings, especially designed for the purpose. The various troughs are connected with surface corrugated metal drain pipes which will collect and distribute the surface water into natural drainage outlets. In addition to concrete troughs and metal drain pipes, terra cotta conduits have been installed to carry wires of the lighting system.

The entire flying area is paved with penetrating macadam surface consisting of layers of slag from six to eight inches in thickness, completely rolled and bound with a tar or asphaltic material. The top coat consists of the same asphaltic material on stone chips, providing a surface hard enough and yet resiliant enough to permit the safe landing of planes on the entire area and eliminating dust and mud.

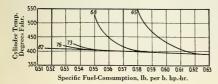
A gigantic job it has been. Out in the middle west where the country is flat the job could have been done for a fraction of the cost of the local airport. But not in the Pittsburgh district. However, nature has been beaten by brains, brawn and dollars supplied by the citizens of Allegheny County and Pittsburgh to insure their district's taking its rightful place in aviation.



View of the completed field at Pittsburgh, where men moved mountains to make an airport

# Make your engine more efficient with STANAVO

—get more power and use less gas!



Look at the chart above—a graphic record of independent experimental tests made by a leading aviation engine manufacturer. The curve at the right was made using an automobile-type gasoline—octane number 65. The engine used .58 lbs. of fuel per brake horsepowerhour. The cylinder temperature ran dangerously high, 550°. Fahrenheit!

Look at the curve farthest to the left, made in the same engine with a fuel of 82 octane number. The engine in this case used only .51 lbs. of fuel per horse-power-hour. The cylinder temperatures were never more than 410° Fahrenheit.

That's quite a difference—worth considering when you buy gasoline—worth money in actual fuel saved. It's worth money also in lower maintenance costs for lower cylinder temperatures mean smoother operation, better lubrication, and longer engine life.

That's why Stanavo lays such stress on knock rating. Wherever you buy any grade of Stanavo Aviation Gasoline it is of uniform high quality.

The manufacturer of your engine has approved Stanavo products. He can tell you the grade of fuel to use, or the Stanavo distributor will be glad to consult with you.

The Stanavo Specification Board has adopted the Army and Navy practice of testing aviation fuels at 300° F. jacket temperature in the Ethyl Gasoline Corporation Series 30 engine at 600 r.p.m. and 15° spark advance. As anti-knock value decreases with increased cylinder temperatures, this is a more exacting test for aviation fuels than the standard adopted by the S. A. E. for automotive fuels where the jacket temperature is 212° F.



# STANAVO AVIATION GASOLINE AND ENGINE OIL

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Organized and Maintained by

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# CURRENT AIRPORT AND AIRWAY FACTS

Pan American Adds Link to Close Gap in South American Circle

WITH the recent inauguration by Pan-American Airways of air service down the Atlantic coast the last major gap in the circle of American airlines around South America was closed.

On October 25, Pan-American Airways made the first flight on the route from Rio de Janeiro to Montevideo and to Buenos Aires, Argentina, completing a system which links to United States all but two countries of the Western Hemisphere.

This service marks the first entry of American lines into the large commercial cities of Brazil, which have been served for some time by European airlines.

From Miami the service links Cuba, Haiti, the Dominican Republic, Porto Rico, the Virgin Islands, British West Indies, Trinidad, the three Guianas, Brazil, Uruguay. Service along the Pacific Coast has been operated by Pan-American Airways for several years.

The 7,500-mile route from Miami to Buenos Aires will be flown with flying boats which accommodate twenty passengers, 1,000 pounds of mail and a crew of four.

## Interline Air Express Arrangement Is Announced by Three Airlines

THE first interline air express arrangement to be effected in this country was recently announced jointly—Transcontinental & Western Air, Inc., Pennsylvania Airlines, Inc. and United States Airways, Inc.

Through this new arrangement, which went into effect November 16, Pennsylvania Airlines and United States Airways will handle through air express shipments to and from connecting points on the entire system of Transcontinental & Western Air, Inc., providing air express service to Akron and Cleveland, Ohio; Washington, D. C.; Topeka, Salina and Goodland, Kansas; and Denver, Colorado.

Store door pick-up and delivery service will be offered in all cities by Postal Telegraph Company and is included in the air express rates.

ir express rates. Transcontinental & Western Air, Inc., has also arranged with Greyhound Bus Lines a combination air-bus service on a nation-wide basis for both passenger and express.

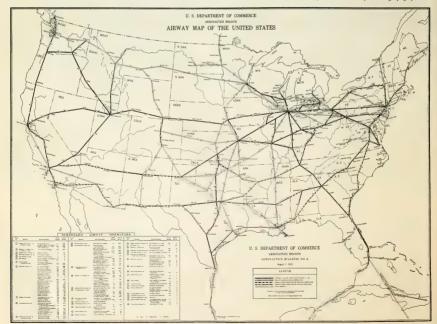
### Century Air Lines Inaugurates Express Service Handled by Personnel

CENTURY AIR LINES, a division of the Cord Corporation, operating between Chicago, Detroit, Toledo, Cleveland, St. Louis, and intermediate points, has opened a new express service, a supplement to the regular passenger service, in which only Century express employees handle shipments during their entire routing from shipper to consignee.

### E. A. T. Opens Route Between Atlanta, Augusta and Savannah

A NEW air passenger route between Atlanta, Augusta, Charleston and Savannah was put into operation on November 20 by Eastern Air Transport, Inc. The new route is an important connection between the two trunk lines of the Eastern Air Transport system, one of which extends northward from Atlanta to Richmond and the other from Florida points northward to Richmond, where they join and extend to New York

(Continued on following page)



Department of Commerce airways map of the United States as of August 1, altered to show changes up to November 15.



# 71,000 record-breaking miles without an overhaul

# **EUROPEAN FLIGHTS**

|                    | Mites | Hrs. | Min. |
|--------------------|-------|------|------|
| Paris to London .  | 218   | _    | 59   |
| London to Berlin . | 600   | 2    | 57   |
| Stockholm to       | 1     |      |      |
| Malmo, Sweden .    | 320   | 1    | 30   |
| Malmo to Paris .   | 700   | 3    | 15   |
| Copenhagen to      |       |      |      |
| Amsterdam          | 460   | 2    | 30   |
| Paris to Rome .    | 700   | 3    | 30   |
| Budapest to Rome   | 650   | 3    | 30   |
| London to Rome*    | 950   | 4    | 44   |
| Rome to London*    | 950   | 5    | -    |
| London to Dublin   | 320   | 1    | 40   |
| *Same day          |       | -    |      |

THE aviation industry will readily appreciate that the TEXACO 13 might be accurately termed a "flying laboratory."

Few planes, or motors, have been tested under such severe conditions. Continuously flying at unprecedented speeds on two continents, Captain Hawks has focused the attention of the world, lay and professional, on the advantages of speed. Those who know, realize the demands occasioned by over 71,000 miles of flying at such recordbreaking speeds.

Texaco Lubricants and Texaco Aviation Gasoline, exclusively, were used on these

flights. So well did they perform that even after 71,000 record-breaking miles no engine overhaul was necessary.

It is a tribute to Captain Hawks for his wonderful handling of the ship, to the high quality of the Texaco Products and to the Wright Whirlwind motor, which functioned so perfectly throughout the flights.

Texaco Aviation Products are used exclusively at foremost aviation schools and flying bases, and are available at principal airports throughout the country. Write

The Texas Company.

# AMERICAN FLIGHTS

|                     | Miles | Hrs.       | Min |
|---------------------|-------|------------|-----|
| New York to         |       |            |     |
| Los Angeles         | 2510  | 14         | 50  |
| Chicago to New York | 750   | 3          | 20  |
| Detroit to New York | 640   | 2          | 41  |
| Boston to New York  | 210   | _          | 52  |
| Philadelphia to     |       |            |     |
| New York            | 90    | _          | 20  |
| New York to Havana* | 1403  | 8          | 8   |
| Havana to NewYork*  | 1403  | 7          | 30  |
| Montreal to         |       |            |     |
| New York            | 350   | 1          | 45  |
| Edmonton to Calgary | 179   | <b> </b> – | 50  |
| #Same day           |       |            |     |

@ 1931 The Texas Compan-

THE TEXAS COMPANY 135 East 42nd Street, New York

TEXACO AIRPLANE OILS . TEXACO AVIATION GASOLINE TEXACO AERODIESEL FUEL TEXACO MARFAK GREASES TEXACO ASPHALT PRODUCTS FOR RUNWAYS, HANGAR FLOORS AND APPRONS, AND DUST LAYING

(Continued from preceding page)
and the North.

Also the new service will form an important junction in Atlanta with planes of the American Airways to Cleveland, Cincinnati, Nashville and the Southwest.

### Eastern Air Transport Reduces Fares by Fourteen Per Cent

SWEEPING reductions in air passenger rates averaging 14 per cent in one-way fares and 25 per cent in round trips have been announced by the Eastern Air Transport system. The cut affects each of the twenty-two cities between New York, Washington, Atlanta, Jacksonville and Miami served by this airline and between New York and Atlantic City.

### Department of Commerce Establishes New Airport Rating Higher Than A-I-A

A NEW airport rating, higher than the A-I-A designation, has been established by the Department of Commerce and will be designated by the symbol A-T-A. This gives the department five ratings instead of the former four.

The new rating applies only to the size of the runways on the field. The T rating requires a landing area of 3,500 feet, with approaches from which a tento-one guide or climb is possible.

Seaplane airports desiring a T rating must have an effective landing area large enough to permit a 5,500-foot run in all directions and be situated to provide clear approaches.

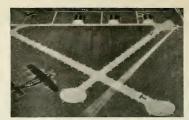
### United Air Lines Publishes Logs for Air Travelers

UNITED AIR LINES has just published very distinctive, colored air logs for its New York-Chicago, Chicago-San Francisco, Chicago-Dallas and Seathel-San Diego routes for distribution to passengers. These air logs are somewhat similar to those which have been used by certain leading European lines, and have proved of much interest to air travellers.

### Pan American Passenger List Leads in First Nine Months of 1931

MARKING it the heaviest carrier of passengers of all the United States air mail lines, and setting a new record with the largest number of passengers carried by any international airline in the world, the Pan-American Airways System carried a total of 31,202 passengers over the international routes in the first nine months of this year.

Averaging better than 100 passengers a day over the international airways, the figures represent a substantial increase over the same period of last year. Likewise, a new high mark was set with 9,300,728 passenger miles flown during the nine months, a gain of approximately 500,000 miles over comparable figures of a year ago.



# LIGHTING SYSTEM AT PORT COLUMBUS

PORT COLUMBUS, Columbus, Ohio, recently placed in operation a new system of runaway lights which marks a significant advance in airport lighting development.

A row of Westinghouse marker lights has been placed along each side of the two long runaways with the top of each lens flush with the surface of the field.

The light is directed upward and marks out to the incoming pilot two clearly defined pathways on which he may alight at night and on dark winter days with perfect safety.

The operation of the new system is extremely simple. The incoming pilot is guided to Port Columbus by the standard airport beacon. The limits of the airdrome and surrounding obstacles are indicated by the boun-

dary and obstruction lights. As he arrives over the field, a master twelve-million candlepower light is turned on to show that the field is free of obstacles, such as ships that have previously landed, but which have not yet cleared the field. The floodlight is then turned off and the seventy-seven runway lights turned on, indicating the definite location of the hard surface channels, as well as the exact true elevation of the ground. Both runways will be lighted at the same time.

# ATLANTIC FLIGHTS

(Continued from page 37)

Harbor Grace to Bickse, near Budapest, in 26:12:00. They left New York July 13.

105. July 25. Hugh Herndon, Jr., and Clyde Pangborn in the Miss Veedol (Bellanca-P. & W. 420 cabin land monoplane) from New York. Their gas load was dumped in the course of take-off and flight postponed.

106. July 25. Russell Boardman and John Polando in the Cape Cod (Bellanca-Wright 300 cabin land monoplane) from Floyd Bennett Field, New York. They dumped their fuel a few minutes after take-off for Istanbul and flight postponed.

107. July 28-9. Russell Boardman and John Polando in the Cape Cod (Bellanca-Wright 300 cabin land monoplane) from Floyd Bennett Field, New York, to Istanbul, Turkey. WORLD AIR LINE DISTANCE RECORD.

108. July 28-9. Hugh Herndon, Jr., and Clyde Pangborn in the Miss Veedol (Bellanca-P. & W.-420 cabin lisso Monoplane) from Floyd Bennett Field, New York, to Moylgrove, Pembrokeshire, Wales. in 32:00:00.

The Cape Cod, Veedol flights were the 55th and 56th completed air crossings and the 44th and 45th non-stop.

109. July 27. Parker D. Cramer and Oliver Pacquette took off from Detroit, Mich., on a flight to Denmark in Dieselpowered Bellanca equipped with seaplane floats. Lost at sea.

110. Aug. 9-17. Capt. W. Von Gronau,

Edward Zimmer, Fritz Albrecht and Franz Hack (Dornier Wal flying boat) on flight from Germany to the United States. Landed in Iceland, Greenland, Labrador and Canada. Arrived at Chicago, Sept. 2.

111. Aug. 19-Sept. 7. Edwin L. Preston and Robert H. Collignon (Stinson Junior monoplane, Packard Diesel), attempted flight from Detroit, Mich., to Copenhagen, Denmark, to search for Cramer and Pacquette and chart a northern mail route to Europe. Turned back.

112, 113. Aug. 30-Sept. 7. The airship Graf Zeppelin, with Dr. Hugo Eckener in command, made a commercial round trip flight from Friedrichshafen, Germany, to Pernambuco, Brazil, carrying mail and passengers.

114. Sept. 12. Willy Rody, Christian Johanssen, and Fernando Viega (Junkers monoplane W. 35) took off at Juncal do Sol near Lisbon for New York. Flight began from Berlin, Aug. 22. Forced down eight miles off Newfoundland; picked up by the Norwegian motorship Belmoira.

115, 116. Sept. 18-29. The airship Graf Zeppelin, under command of Capt. Ernst Lehmann, made a commercial round trip flight from Friedrichshafen, Germany, to Pernambuco, Brazil, carrying passengers, mail, and a crew of forty-three.

117, 118. Oct. 17-28. The airship Graf Zeppelin, commanded by Capt. Ernst Lehmann, made a round trip flight from Friedrichshafen, Germany, to Pernambuco, Brazil, carrying seventeen passengers on the westbound trip.

# From New York to San Francisco-



FIFTEEN million air miles . . . 72,000 take-offs and landings each year! That's the record of Transcontinental and Western Air, Inc., since its inception five years ago.

Its fleet of fifty big cross-country planes travels through all kinds of weather. No two landing fields are ever just alike.

Certainly this company is qualified, with its wealth of flying experience,

to comment authoritatively on the subject of airplane tire performance.

Says Mr. Jack Frye, Vice-President of Operations, "The selection of tire equipment for an exacting service such as ours is a matter of paramount importance. TWA can't afford to

take chances. Nothing short of the best will

Whether yours is a light speed plane or heavy-laden transport, you, too, will find an extra margin of safety, comfort and dependability in Goodrich Low Pressure Tires.

Goodrich Low Pressure Tires can be easily and quickly installed on any plane, with or without brakes. For further information, phone your nearest Goodrich Distributor or write to the Aëronautical Division of

flight.

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A Goodrich Silvertown
"off duty," as seen from
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# RUBBER FOR AIRPLANES

Another B. F. Goodrich Rubber Product—over 40 rubber articles for airplanes. Silvertown Tires.. Streamline Windshields.. Tail Wheels.. Hose.. Tubing.. Engine Mounts.. Crash Pads.. Accessories.

# Chronology of Some of the Important Aeronautical Events of 1931

## JANUARY

(Brazil.) Ten Savoia-Marchetti flying boats of the Italian Air Service under the command of General Italo Balbo, completed at Natal a formation flight of 1,875 miles across the South Atlantic from Bolama, Africa in 18 hours and 46 minutes. (Jan. 6.)

(New Zealand.) A record-breaking flight of 1,200 miles from Australia across the forman Sea to Wellington, N. Z., was completed in 12 hours and 15 minutes by Guy Menzies in the Southern Cross, Jr. (Jan. 7.)

The Third Annual Miami All-American Air Races and Navy Field Dedication were held at the Miami Municipal Airport, Miami, Fla. (Jan. 8-10).

A new world's refueling endurance record for women of 122 hours and 20 minutes was established by Misses Bobbie Trout and Edna May Cooper at Los Angeles, Calif. (Jan. 9.)

## FEBRUARY

Reductions in air passenger transport fares of from eight to forty per cent over its airlines connecting the United States with twenty-eight Latin-American countries, were announced by Pan American Airways. (Feb. 11).

(Panama.) The annual winter maneuvers of the U. S. Fleet started in the waters off Panama. Aircraft carriers and planes and the airship Los Angeles participated. (Feb. 12).

### MARCH

(Algeria.) Two French pilots, Lucien Bossoutrot and Aime Rossi broke the world's distance and duration records for flight in a closed circuit by remaining in the air without refueling for seventy-we hours and twenty-three minutes during which they covered 5,468 miles. The flight was made at Oran. (March 1.)

Appropriations totaling more than \$100,000,000 were made for military, naval and commercial aviation. (March 4.)

World's altitude record for women of 28,743 feet was established by Miss Ruth Nichols in a Lockheed Vega monoplane, taking off and landing at Newark Airport, Newark, N. J. (March 5.)

(Egypt.) The first plane took off from Cairo for Mwanza, Central Africa, inaugurating the North African division of Imperial Airways' projected London-Cape Town Airline. (March 6.)

(France.) Pilots Regimensi and Lalouette landed at Le Bourget Airport after having broken the world's distance and duration records for planes carrying a useful load of 2,000 kilograms. They set a new dura-

tion record of seventeen hours and three minutes, a distance record of 2,678.6 kilometers and an international speed record for the distance and the load of 157.99 kilometers per hour. (March 10.)

(Hawaii.) A three-day aerial war game, in which the Air Corps and anti-aircraft units in Hawaii participated, closed with a successful defense of Honolulu by the Eighteenth Pursuit Group. (March 11-13.)

(Germany.) A rocket containing scientific apparatus was successfully shot in the air during tests conducted near Bremen by Karl Poggensee. (March 13.)

(Panama Canal Zone.) A heavy field-gun battery composed of four 75-millimeter guns was transported by aircraft from France Field to Rio Hato, in an experiment conducted by the Air Corps to test the practicability of transporting artillery for the purpose of Canal defense. (March 20.)

(France.) Seven world's records for speed, distance and duration for planes carrying 2,000 kilograms (4,400 pounds) over a closed circuit were established by Joseph Lebrix and Marcel Doret. They set new records for endurance with loads of 500, 1,000 and 2,000 kilograms; for distance with the same loads and a speed record for a distance of 2,000 kilometers carrying a weight of 2,000 kilograms. They traveled approximately 4,021 kilometers (2,513 miles) on the flight. (March 24).

The Third National Airport Conference was held at the Mayo Hotel, Tulsa, Okla. (March 25-27.)

# APRIL

(France.) Jean Mermoz and Antoine Fillard, French pilots, broke the world's non-refueling record for endurance flying in a closed circuit, covering more than 5,679 miles in 59 hours and 14 minutes. (April 2.)

(South Africa.) A new record of six days and ten hours for a flight from London to Cape Town was completed by Lieut-Comdr. Glenn Kidston in his Americanbuilt Lockheed Vega monoplane. (April 6.)

(France.) Two French pilots, Froton and Lavergne, set new records for duration and distance over a closed circuit for light two-place planes, flying for 29 hours, 38 minutes and 45 seconds, covering 2,153 miles. Their flight was made from the Istres flying field near Marseilles, (April 9.)

(Australia.) C. W. Scott broke Wing Commander Charles Kingsford-Smith's record for a flight from England to Australia, setting a new mark of nine days, four hours and eleven minutes. He landed at Port Darwin on the last lap of the flight from Sumatra. (April 10.)

The International Aircraft Show was held in the large hangar at the Detroit City Airport, Detroit, Mich, sponsored by the Aeronautical Chamber of Commerce and the Aircraft Bureau, Detroit Board of Commerce. (April 11-19.)

Ruth Nichols established a new international speed record for women of 210,685 miles per hour on a flight over a threekilometer course at Grosse Ile Airport, Detroit, Mich, breaking the former record of 181.157 miles per hour set by Amelia Earhart. (April 13.)

(England.) Capt. Frank M. Hawks, American pilot, set a new record for a London-Rome flight. Using the Travel Air Mystery S monoplane Texaco 13, Captain Hawks flew the 900 miles from London to Rome in five hours and 26 minutes. The former record was 12.5 hours. (April 22.)

### MAY

(Germany.) A new world's distance gliding record of 165 miles was claimed by Pilot Groenhoff of the Rhoen-Rossiten Society after a flight from Munich, Bavaria, to Kaaden, Czechoslovakia. (May 5.)

Award of the Daniel Guggenheim Gold Medal for notable achievement in aeronautics to Dr. Frederick William Lancaster of Birmingham, England, for his contribution to "the fundamental theory of aerodynamics," was announced. (May 9.)

(Mexico.) The Aeronautical, Industrial and Commercial Exposition was held at Valbuena Field, Mexico City. (May 15-21.)

(Sweden.) The International Aero Exhibition was held at Stockholm. (May 15-31.)

New York City was "attacked" and "defended" by air in a demonstration staged by the Army Air Corps as part of the annual field exercises. There were 672 planes participating in the aerial "battle" and parade. (May 23.)

(Canada.) Capt. John D. Parkinson reached an altitude of 22,000 feet on a flight at Montreal, exceeding by 2,000 feet the Canadian altitude record which he established two years ago. (May 26.)

(Germany.) A new world's altitude record of 52,480 feet was established by Professor Auguste Piccard and Dr. Charles Kipfer in a hydrogen balloon with an airtight gondola' of aluminum. Eighteen hours and thirteen minutes after taking off from Augsburg, Germany, they landed on a gla-(Continued on following page)

# United Air Lines Fly 35,000,000 Miles with STROMBERG Carburetors

UNITED Air Lines is the largest air system in the world. They recently completed 35,000,000 miles of commercial flying; 15,000,000 of them at night. The latter figure represents five times as much night flying as in all the nations of Europe combined.

The United fleet is powered by Wasp

and Hornet engines, each one equipped with a Stromberg Carburetor. You'd expect it—only the best can stand United Air Line operating conditions; from sea level to 12,000 feet; and at temperatures ranging from 40° below to 120° above.

Stromberg Carburetors are standard equipment on 95% of all the planes flying in the United States today.

Reasons: Easier starting, smoother idling, more economical; at all speeds,

more power.

Stromberg engineers with 2.2 years carburetion experience will gladly cooperate in working out your carburetion problems.



STROMBERG CARBURETORS

BENDIX STROMBERG CARBURETOR COMPANY

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cuer above Ober Gurgl, Oetz Valley, in the Tyrolian Alps. (May 27.)

A new world's non-refueling endurance record of eighty-four hours and thirty-three minutes was established at Jacksonville Beach, Fla., by Walter Lees and Frederick Brossy in a Diesel-powered Bellanca monoplane. (May 28.)

A pilotless monoplane was successfully flown by radio control from another plane at the municipal airport, Houston, Texas. (May 31.)

### JUNE

(France.) Lieutenants Paris and Gonord established new world's scaplane records for distance and continued flight over a circuit of 115 miles at Arcachon. They covered 3,230 miles in thirty-six hours, forty-eight minutes and forty-four seconds. (June 5.)

(France.) The French pilots Joseph Lebrix and Marcel Doret established a new world's closed circuit distance record of 10,500 kilometers (approximately 6,500 miles) on a flight of seventy hours and ten minutes, terminated at Marignane. (June 10.)

(Denmark.) Flying the Bellanca monoplane Liberty, Otto Hillig and Holger Hoiriis landed at Copenhagen, completing a flight from Hasbrouck Heights, N. J., via St. John's and Harbor Grace, Newfoundland, and Krefeld and Bremen, Germany. On the flight, which began June 19, they crossed the Atlantic from Harbor Grace to Krefeld in approximately thirty-two hours. (June 26.)

## JULY

Wiley Post and Harold Gatty in the Lockheed Vega Winnie Mae completed a world flight around the Northern Hemisphere from New York to New York. They covered a total distance of 15,474 miles in a total elapsed time of eight days, fifteen hours and fifty-one minutes, or a flying time of four days and ten hours. (July 1.)

(Hungary.) Capt. George Endres and Alexander Magyar in the *Justice for Hungary*, Lockheed monoplane, flew from Harbor Grace to Beckse, near Budapest. (July 15-16.)

With ten planes competing, the National Air Tour for the Ford Reliability Trophy completed at Detroit, Mich., a 4,858-mile flight at speeds averaging from 64 miles per hour to 143 miles per hour. Awarded on a point-score basis, the trophy went to Harry L. Russell, last year's winner, who piloted a trimotor Ford with three Wright engines, L. R. Bayles, in a Granville Bee Gee won the Great Lakes Trophy for light planes. (July 25.)

(England.) Although extremely difficult weather was encountered, twenty pilots out of forty starting completed the annual 982.5mile King's Cup Air Race around Britain and unusually high speeds were attained by the winners. Flying officer E. C. T. Edwards, R.A.F., placed first with an average speed of 117.8 miles per hour in a Blackburn "Bluebird" biolane. (July 25.)

(Germany.) The International Soaring Meet, participated in by more than ten countries, was held at Wasserkuppe. (July 28-August 10.)

Colonel Charles A. Lindbergh left North Beach Airport, Queens, N. Y., on a flight to Japan, via Canada, Alaska and Sibria. He was accompanied by Mrs. Lindbergh and flew a Lockheed Sirius monoplane equipped with seaplane floats. (July 29.)

(Germany.) Carrying a party of scientists, Graf Zeppelin returned to Germany, completing a seven-day cruise to the Arctic for the purpose of exploring the Far North from the air. (July 30.)

(Turkey.) Boardman and Polando landed at Istanbul on a flight from New York, establishing a new world's long distance record of 4,986 miles in forty-mine hours and nineteen minutes, exceeding the former record of 4,9127 miles set by Dieudonne Coste from Paris to Manchuria two years ago. (July 30.)

### AUGUST

For the second successive year, Albert E. Hastings won the Edward S. Evans Trophy for the American championship in gliding at the National Gliding and Soaring Contest, held at Elmira, N. V. Among his accomplishments at the meet was a duration flight of seven hours and thirty minutes. (August 2-16.)

(Japan.) Miss Amy Johnson landed at the Tachikawa Airdrome, completing a flight in easy stages from London in ten and one-half days. (Aug. 6.)

(England.) J. A. Mollison landed at Pevensey Bay on a 10,000-mile flight from Australia in eight days, twenty hours and nineteen minutes, bettering by approximately two days the former record of ten days and twenty-three hours established recently by C. W. Scott. (August 6.)

The German flying boat Do.X landed in New York harbor, completing a flight from Lake Constance, Switzerland, via Holland, England, France, Spain, Portugal, Canary Islands, the West African coast, South America and northward along the Atlantic Coast. (August 27.)

(Italy.) A total of 894 aircraft began maneuvers of the Italian Air Force over a period of several days to test Italy's air defense and the use of planes in mass formations independent of the navy and army. (August 28.) The Eleventh Annual National Air Races were held at Cleveland Airport, Cleveland, Ohio. (August 29-Sept. 7.)

### SEPTEMBER

Under the command of Capt. W. Von Gronau, the Groenland-Wal, twin-motored airplane, completed at Chicago, Ill., a 4,000-mile flight from Westernland, Germany, via Iceland, Greenland, Labrador and Canada. (Sept. 1.)

(England.) Without competition from other nations, Great Britain won permanent possession of the Schneider Trophy with a new record for the race in a speed test at Calshot when Flight Lieutenant J. N. Boothman attained an average speed of 340.08 miles per hour over the triangular ocurse. The first two laps, covered at an average speed of 342.9 miles per hour, made a new record for 100 kilometers. Flight Lieutenant G. H. Stainforth broke the world's record on the three-kilometer straightaway course with an average speed of 379 miles per hour. (Sept. 13.)

(England.) Using a new fuel and an engine built solely for the test, Flight Lieutenatt G. H. Stainforth established a new world's seaplane speed record of 408.8 miles per hour average in five runs over a three-kilometer course on the Solent in a Supermarine S6B seaplane. His fastest lap was 415.2 miles per hour. (Sept. 29.)

### OCTOBER

Clyde Pangborn and Hugh Herndon, Jr., landed at Floyd Bennett Field, Brooklyn, N. Y., completing a 'round-the-world flight which started at the field more than two months previously. In the course of the flight they completed the first non-stop aerial crossing of the Pacific from Japan to the United States, (Oct. 17.)

The airship Graf Zeppelin, commanded by Capt. Ernst Lehmann, made a round trip flight from Friedrichshafen, Germany, to Pernambuco, Brazil, the third such trip during the summer. (Oct. 17-28.)

A flight of approximately 2,500 miles from Ottawa, Canada, to Mexico City, Mexico, was completed by Major James H. Doolittle in a total flying time of eleven hours and forty-five minutes at an average flying speed of 212.7 miles per hour. Total clapsed time was twelve hours and thirty-six minutes, stops for refueling being made en route at Washington, D. C., Birmingham, Ala., and Corpus Christi, Texas. (Oct. 20.)

### NOVEMBER

A brief resumé of the events occurring during November will be found on page 77 of this issue. DECEMBER, 1931



upon tubing, now generally used for the fusilage construction.

In the manufacture of NATIONAL-SHELBY Aircraft Tubing, all the accumulated knowledge and experience of the largest manufacturer of tubular products in the world are concentrated on the one object-reliability. Every foot is subjected to the most rigid inspections and tests and is both physically and chemically made to conform to United States Army and United States Navy Specifications.

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# RECENT AERO PATENTS

THE following patents of interest to readers of Aero Digest recently were issued from the United States Patent Office. Copies thereof may be obtained from R. E. Burnham, patent and trade-mark attorney, 1343 H Street, N.W., Washington, D. C., at the rate of 20c each. State patent number and inventor's name when ordering.

Rotary wing for aeroplanes. Frederick Wander, jr., New York, N. Y. (1,825,493.)

Brake control for aircraft landing wheels. Walter J. Carr, Saginaw, Mich., assignor of 1/2 to Paramount Aircraft Corp. and 1/2 to George C. Willcox, same place. (1,825,-

Airplane. Antonio Cernuda, Habana, Cuba. (1,825,578.)

Flying boat. Otho W. Johnson, Baltimore, Md. (1.825,592.)

Airplane control. Charles Wald, Freeport, N. Y. (1,825,609.)

Shoe for aeroplane brakes, John B. Cautley, South Bend, Ind., assignor to Bendix Brake Co. (1,825,653)

Propeller with variable pitch. Marius Barbarou, Paris, France. (1,825,768) Airplane, Augustus M. Henry, Brook-

lyn, N. Y. (1,825,762)

Cowl muffler for airplane engines. Ashley C. Hewitt, Essex Falls, N. J., assignor to Engineering Development Associates, Plainfield, N. J. (1,825,794)

Propeller. Horace Hull, Denver, Colo. (1.825,868)

Variable pitch propeller. William A. Matthey, Kansas Ĉity, Mo. (1,825,881) Gyroscopic system for controlling dirigible craft. Philip A. Cooke, Farnborough, England. (1,825,994) Gyroscopic control system for dirigible

craft. Frederick W. Meredith, Farnborough, England. (1,826,013)

Airplane, Amel B. Broluska, Detroit, Mich. (1,826,048)

Aircraft. Albert S. James, Eureka, Calif. (1,826,076)

Parachute. Josef Hammerle, New York, N. Y. (1,826,245)

Aircraft parachute. Fr: Brooklyn, N. Y. (1.826,556) Frank Loske,

Stabilizing device for aircraft. Bela Kiss, New York, N. Y. (1,826,938) Propeller. Walter H. Sargent, Malden,

Mass. (1,826,957)

Wind intensity and direction transmitter and indicator. Joseph S. Jones, Brooklyn, N. Y., assignor to Chas. Cory Corp., New York, N. Y. (1,827,151) Airplane construction. Heraclio Al-

faro, East Cleveland, Ohio. (1,827,181)

Control apparatus, Gail Borden, 2d, and Eric Carlton, New York, N. Y. (1,827,185)

Landing gear, Boris V. Korvin-Kroukovsky, Beechhurst, N. Y., assignor to Edo Aircraft Corp, College Point, N. Y. (1,827,242)

Airplane. Robert S. Moore. Silver Spring, Md. (1.827,253)

Airplane. Heraclio Alfaro, East Cleve-

Wing or plane for aircraft. Edmund B. Cairns, New York, N. Y., assignor to Cairns Development Co., Wilmington, Del. (1,827,281)

Means for controlling aircraft, submarines and like totally-immersed craft or structures. Albert P. Thurston, London, England, (1,827,304)

Airplane. John D. Rauch, Lima, Ohio. (1,827,438)

land, Ohio, (1,827,276)

Airplane. John Squiers, Detroit, Mich. (1.827.441)

Airplane. Erwin Studer, Chicago, Ill. (1,827,548)

Airplane parachute flare. Thurman L. and Harry W. Hoehn, Lancaster, Pa. (1,827,580)

Aircraft, Frank D. Williams, Los Angeles, Calif. (1,827,771)

Airplane. Randolph F. Hall, Ithaca, N. Y. (1.827.845)

Airplane control device. McClellan

Davis, Portland, Oreg. (1,827,933)
Airplane. Clara B. O'Connor, San
Francisco, Calif. (1,827,953)

Glider. Henry E. Kingsley, Chicago, III. (1,827,987)

Aircraft. Walter J. Cline and Martin F. Wagner, San Diego, Calif. (1.828,026) Aircraft navigation light. Charles H. Colvin, Brooklyn, N. Y., assignor to Pioneer Instrument Co. (1,828,097)

Wing brake for aeroplanes. Frank Suchofsky, Hoboken, N. J. (1,828,161) Aircraft. Joseph W. Gwinn, Jr., Buf-

falo, N. Y. (1,828,184)

Aircraft. Isaac M. Laddon, Buffalo, N. Y., assignor to Consolidated Aircraft Corp., same place, (1,828,192)

Device for taking up and setting down aircraft, on or from platforms such as ships or landing stages. Woldemar Kiwull, Riga, Latvia, (1.828,251)

Aircraft control mechanism. Paul Maiwurm, San Diego, Calif. (1,828,253)

Variable pitch propeller. Wallace R. Turnbull, Rothesay, N. B., Canada. (1,828,303)

Dirigible helicopter. Young Ho Koun, New York, N. Y. (1,828,607)

Ice removing system (for aircraft). Swan E. Norton, Rockford, Ill. (1,828,-

Braking apparatus for aircraft, Michael Bergeron, Paris, France. (1,828,641) Collapsible hull for light boats, floats for aircraft, and the like. Richard J. H.

Hudson, London, England. (1,828,805) Compass-course and ground-speed indicator. Robert E. Kennedy, Los Angeles,

Calif. (1.828.807) Flying machine. Sandor Rosenberg and Jacob Hochman, Brooklyn, N. Y. (1.828.819)

Aerial delivery device. Roy Fisher, Montebello, Calif. (1,828,928)

Airplane. Francis F. Parker, Los Gatos. Calif. (1.828.981)

Aircraft propelling means. Joseph B. Shainline, Norristown, Pa. (1,829,064)

Aircraft. John Bayerlein, Maspeth, and Anton A. Seiler, New York, N. Y.

(1.829.080)Inverted stick control. Flavius E. Loudy, Akron, Ohio, (1.829,098).

Aerial camera mount. Carl Hyden, Dayton, Ohio. (1,829,142)

Flying machine. Francis D. Healy, Newark, N. J. (1,829,350) Airplane. Joseph Rothschild, Buffalo,

N. Y. (1,829,372)

Propeller. Robert R. Gobereau and Lucien E. Maujole, Paris, France, (1,-829, 443,

Method and device for establishing communication between aircraft in flight and the ground, Constantin Chilowsky, Paris, France. (1,829,474)

Landing wheel. William Brown, Irv-ington, N. J. (1,829,500)

Hangar for dirigibles. Charles J. Carlotti, New York, N. Y. (1,829,503) Hangar. Charles J. Carlotti, New

York, N. Y. (1,829,504) Automatically-opening parachute. Samuel H. Knight, Lancaster, Pa., assignor to Follmer, Clogg & Co. (1,829,561)

Device for continuously recording the path of flight of aircraft. Reinhard Hugershoff, Dresden, Germany. (1,829,594) Flying machine. David K. Jette, Midskog, Sweden, (1,829,595)

Safety attachment for airplanes. John F. O'Malley, Flushing, N. Y. (1,829,607) Airplane. Edward A. Stalker, Ann Arbor, Mich. (1,829,616)

# DRILLING MACHINE

SPECIAL machine for drilling and counterboring several different size radial holes in a drop forged steel part was recently developed by the Ex-Cell-O Aircraft & Tool Corporation. The part to be drilled had thirteen holes unevenly distributed around the periphery with the depth and size varying.

In the complete machine the heads and fixture are located in the center, the fixture in the exact center with the multiple drill heads mounted on either side. The head at each side is full ball bearing and direct-motor driven.

The heads are mounted vertically on the slides of a specially designed twoway hydraulic feed machine while the fixture is mounted on the bed of the machine proper. The motors driving the multiple head are mounted in the slides supporting the multiple heads. The heads are approximately six feet in diameter.

The part to be drilled is located in the fixture by a three-point bearing and is clamped by means of an equalizing toggle operated by a spanner.

# **GERMAN** TRANSPORT **AIRPLANES**

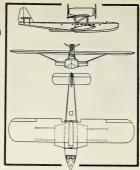
(Part VI)

(Continued from the November issue)

# Edwin P. A. Heinze

THE Dornier Wal and Superwal have the same wing span but slightly different areas, the twin-engine plane having 1,539 square feet and the four-engined, 1,475 square feet. The wings have two steel girder spars of the type described and a span of 93.8 feet, while the overall length of the hull is 80.7 feet. The attached wing sections each have a length of 44 feet and a chord of 17 feet. They differ from those of the Wal in that the nose and trailing edges are detachable. The wings have duralumin skin with the exception of the trailing edge attachment, which is fabric covered

The Superwal planes have two cabins, one for eleven to twelve passengers in front of the wing and just behind the collision bulkhead; the other for eight passengers at the rear, the space inside the hull being divided from bow to stern as follows: collision room, large cabin, a longitudinally divided room with the cockpit on the port side and the wireless room on the starboard side, the tankroom and the second cabin.



Twin-engined Do.J "Wal" Seaplane

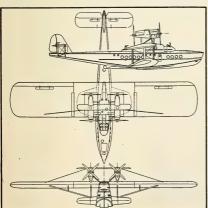
The twin-engined Superwal is generally supplied with geared Packard engines of 800 horse power output, each directly accessible through a manhole in the wing. This ship is capable of a maximum speed of 120 miles per hour, while its cruising speed is 103 miles per hour and watering speed, 66 miles per hour. It weighs empty with all equipment, 1,760 pounds and will take a load of 7,960 pounds, so that the gross flying weight amounts to 25,610 pounds, resulting in a wing loading of 16.6 pounds per square foot and a power loading of 16 pounds per horse power.

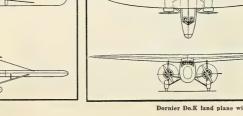
The four-engined Superwal is equipped either with geared Jupiter or Hornet engines and weighs net 19,930 pounds, having a loading capacity of 10,600 pounds, and, therefore, a total weight of 30,530 pounds. With 500-horse power Hornet engines, the power loading is 15.2 pounds per horse power, and the wing loading is 20.7 pounds per square foot. This ship has a considerably higher speed than the twin-engined Superwal, its maximum speed being 137 miles per hour, cruising speed, 118 miles per hour and watering speed, 70 miles per hour.

The empennage of both Superwals is constructed along the same lines as the Wal. In addition to twenty passengers they carry a crew of four persons; two pilots, a mechanic and a wireless operator. The two nacelles of the four-engined Superwal are accessible through a creepway in the wing. The fuel tanks in their special compartment of the hull are eight in number, four on the floor and four suspended from the ceiling. They hold a total of 1,000 gallons.

## The New Wal

The old Wal has, of course, been improved in many details in the course of years, but until recently a thorough overhaul of the design by Dornier had not been effected. As previously mentioned the Wal was and still is being built mainly in Italy and by the other subsidiary companies. The parent company, however, has decided to take up manufacture of a flying boat of this size, and it was natural it should want to take full advantage of the experience gained with the larger and later vessels since the design of the Wal was completed, Thus, what virtually is a new Wal, the Do.I, has been evolved. This is not in any way a radical departure from the former design. In fact only relatively few alterations have been made, mostly in the mat-





Dornier Do.S seaplane with four engines

Dornier Do.K land plane with four engines



The 22-passenger Do.S with four Hispano Suiza 640 h.p. engines

ter of simplifying and improving the aerodynamic and the hydrodynamic qualities. The new ship has a sharper prow and is 2.5 feet longer than the old Wal, measuring 59.5 feet. The span of the main wing has been increased to 76.1 feet, the lifting surface now amounting to 1.184 square feet. The cabin accommodates fourteen instead of ten passengers and the net weight of the plane fully equipped is 10,850 pounds. The normal load capacity is 4,550 pounds and the maximum load, 6,750 pounds. This makes the full flying weight 15,400 pounds and 17,600 pounds, respectively, with a corresponding wing loading of 16.4 pounds per square foot and 13 pounds per square foot and a power loading of 12.8 pounds per horse power and 14.7 pounds per horse power. The BMW VI engines are used, giving the ship a maximum speed of 138 miles per hour, a normal cruising speed of 112 miles per hour and a watering speed of 68.5 miles per hour.

# Dornier Delphin III

A relatively little known but very attractive Dornier flying boat is the single-engined Delphin for nine passengers and a crew of two. This is the only single-engined ship the company builds and it is especially suitable for service on large lakes and rivers.

In appearance the Delphin is rather different from the other Dornier craft, the sides of the hull being drawn high up to the wing with a low bow projecting in front. The engine nacelle is located on top of the forward end of the cabin where the pilots are seated. The wing is constructed in three parts with end sections 29.8 feet in length fitted to the central section and braced against the hull by two struts on each side. The wing has two steel spars, duralumin ribs and duralumin skin, no part of it being fabric covered. The empennage is similar to that on the other Dornier flying boats but, whereas the ailerons and elevators are balanced by small compensating surfaces, the rudder is balanced by the top part projecting out in front of the pivot line. The hull has the same kind of step bottom as all Dornier ships.

The span of the wing is 64.3 feet and the lifting surface, 646 square feet. The hull measures 47 feet in length and the weight of the ship completely equipped is 6,270 pounds, while the load capacity is 1,870 pounds, of which 945 pounds are required by fuel and crew so that 925 pounds remain as payload. The full flying weight being 8,140 pounds, the wing loading amounts to 12.6 pounds per square foot. The Delphin is powered with a BMW VI engine of 600 horse power output so that the power loading amounts to 13.53 pounds per horse power. The maximum speed is 121 miles per hour, cruising speed, 103 miles per hour and watering speed, 59 miles per hour.



Eight-passenger all metal "Merkur" with 600 h.p. B.M.W. engine

# Dornier Do.S Flying Boat

The experience gained with the Do.X naturally has reflected on new designs. Consequently, the new Do.S, a flying boat slightly larger than the Superwal, is practically a small replica of the giant plane. It has three duralumin spars and two decks, the upper of which has the form of a streamlined superstructure on the hull integral with the center section of the wing. The upper deck is exclusively reserved for the crew and has in front a partially open cockpit. The room behind the latter has separate compartments for the wireless operator and the engineer. Two nacelles with four watercooled Hispano Suiza motors of 640 horse power maximum output each are supported on struts above the wing and are joined at the top by a narrow airfoil having approximately one third the span of the main plane, the same as the stub wings on the hull. The cabin has 22 comfortable seats.

The span of the main wing is 101.7 feet, the chord, 19 feet and the lifting area, 2,250 square feet, while the overall length of the hull is 84.4 feet. The wing is fabric covered, and its attached sections are braced by one faired strut on each side, connecting the central spar through the stub wing with the hull. In addition, wire bracing is employed and two perpendicular struts on each side join the fixed middle section of the main wing with the stub wings. The Do.S weighs with equipment 23,100 pounds and has a loading capacity of 12,100 pounds of which 4,840 pounds are payload. The gross flying weight amounting to 35,200 pounds, the wing loading is 15.65 pounds per square foot and the power loading, 13.75 pounds per horse power. The maximum speed is 127 miles per hour, cruising speed, 106 miles per hour and watering speed, 59 miles per hour.

# Dornier Merkur Land Plane

The Dornier Company for many years past has built a successful type of landplane, many of which are operating in the services of the Luft Hansa. The wing construction is identical with that of the older flying boats, the wing having two steel spars and being built in three sections. Duralumin ribs of the box type are used and the covering consists of duralumin sheet, which is strengthened by pressed-in ridges. Each end section of the wing is braced against the lower edge of the fuselage by two faired struts. The central section is supported on struts a short distance above the fuselage, the cockpit with dual control being located beneath the leading edge.

The fuselage is constructed entirely of duralumin with transverse frames, to which smooth duralumin panels are attached. These are reinforced in the manner described at the beginning, additional strength being obtained by a number of horizontal formers riveted on the outside. A single geared BMW VI engine of 500-600 horse power output is installed in the nose. The fuel tank holding 150 gallons is located in the center wing section.

The empennage is erected on top of the fuselage tail, the stabilizer being flush with the fuselage top. Strut bracing is not employed. The stabilizer and rudder fin have steel spars, duralumin ribs and corrugated duralumin covering, while the elevator and rudder have fabric covering. The undercarriage is of the split axle type, the shock absorber struts being hinged to the lower edge of the fuselage. The tail is supported by a skid.

The wing has a span of 64.3 feet and a lifting area of 667 square feet. The fuselage has a length of 42 feet and contains a luggage space beneath the engine and cockpit. Behind the latter is a cabin for from six to eight passengers, a luggage room and a lavatory. The interior being free from struts and constructional projections of any kind, the cabin has a neat and airy appearance. It is ten feet in length, 4.9 feet wide and 5.8 feet high. The Merkur weighs with equipment 4,840 pounds and will take a load of 3,080 pounds. The total flying weight amounting to 7,920 pounds, the wing loading is 11.9 pounds per square foot and the power loading, 13.2 pounds per horse power. The maximum speed is 118 miles per hour and the cruising and landing speeds, respectively, are 103 and 57 miles per hour.

# Dornier Do.K

This landplane, the latest addition to the range of Dornier models, is now undergoing approbation tests. The design is entirely different from any other previous Dornier model. The machine has a fuselage of oval section covered with fabric, a cantilever wing and four engines, arranged two in a nacelle and suspended from the wing on both sides of the fuselage. There are a cabin for ten passengers, an enclosed cockpit for two pilots and two luggage compartments. The plane was built for relatively fast travel over rough country where emergency landings are precarious.

In this machine wide use is made of channel section duralumin. The wing, which has a span of 82 feet, has three duralumin spars. Its leading edge sweeps back to the straight trailing edge and thus has the shape of a bow under tension. The maximum chord measures 13.78 feet and the lifting surface amounts to 977 square feet. Each spar consists of two long channels joined by uprights and diagonals also of channel section, riveted in place.

Between the main ribs the spars are braced by crossed wires top and bottom. The greatest thickness of the wing is



The Do.J, one of the Dornier "Wal" type flying boats

27.5 inches, relatively thin for a cantilever wing of this size, accomplished by using three instead of the usual two spars.

using three instead of the usual two spars. Ailerons are each supported by four hinges secured to the rear wing spar. They are operated by a rod protruding from the top surface of the wing and pivoted to a horn on the ailerons. Otherwise the whole control system, including that of the tail, consists of cables, pulleys and bell cranks. Ailerons are built in a manner similar to the construction of the wings.

The fuselage has a supporting frame of steel tubes, the ends of which are pressed together and slotted to permit gusset plates to be pressed in, by means of which the connections are effected with the aid of bolts. Fore and aft of the cabin space the steel tube frame is braced with wire, while the cabin section has diagonal tubes. Over this rectangular system of steel tubes is slipped and secured a forming frame consisting entirely of channel section duralumin. The frame is very simple; it is built up of a large number of hoops, secured on the outside by numerous longerons, all joints being riveted. The forward end of the fuselage is covered by a large duralumin cap hinged at the top to give access to a spacious luggage hold. Behind this is the pilots' cabin, having a roof superstructure with sliding panels over the

Following the pilots' cabin is the passenger cabin with a lobby aft of it, which has an entrance on the left side and opposite it a lavatory. Further aft is another luggage hold.

The empennage has a duralumin framework and is fabric covered. Elevator surfaces are balanced by the typical small planes evolved by Dornier, mounted a few inches above the stabilizer.

Four Walter "Castor" engines of 240 horsepower each are employed. Their nacelles are suspended by two faired struts from the wing, lateral support being given by two further struts connecting them with the fuselage. The front engines drive four-bladed tractor propellers and the rear ones, two-bladed pusher propellers of wood. Engine control rods are located within the struts and fuel tanks are situated inside the wing between the fuselage and engines.

The machine weighs empty (with equipment) 8,800 pounds and is capable of taking a load of 4,400 pounds, so its full flying weight amounts to 13,200 pounds. With this weight, test flights have been carried out which have shown the plane to possess excellent flying qualities. Its maximum speed is 137 miles per hour. It will travel normally at 125 miles per hour and land about 50 miles per hour. The ceiling is 20,700 feet and with one engine dead the plane will still climb to 12.800 feet. Even with two engines not working it can climb at the rate of 75 feet per minute at an altitude of more than 3,000 feet. The wing loading is 13.5 pounds per square foot while the power loading amounts to 11 pounds per horsepower.



Newly developed Dornier Do.K land plane with four 240-horsepower engines



# STAINLESS STEEL AIRPLANE

TEST flights were recently completed on an amphibion employing a new type of metal construction. Designed by the American Aeronautical Corporation (a subsidiary of the Dayton Airplane Engine Company), this new amphibion, the Savoia-Marchetti model BB-1, is of "shot welded" stainless steel. It was built after several years of research and experiment by the metallurgists and welding technicians of the Edward G. Budd Manufacturing Company, in collaboration with the American Aeronautical Corporation aeronautical engineers, under the direction of Enea Bossi, who acquired, more than twenty years ago, flying license number two of the Italian government.

The model BB-1 amphibion is a fourseater biplane of the tractor type. It has dual side-by-side seating—pilot and passenger in the front cockpit and two passengers in the rear cockpit.

Aside from the complete change from wood to stainless steel construction, this model closely follows the lines of its predecessor, the S-31. However, there are the following improvements embodied in the BB-1 over the previous model—it has a wider hull; seating capacity four instead of three; oversized balloon tires; larger control surfaces; Frise type ailerons; steerable tail wheel which acts as a water rudder; adjustable stabilizer effect obtained by moving strut surfaces of stabilizer; fuel tanks in the upper wings and gravity type fuel system.

The hull possesses good taxiing as well as aerodynamic qualities. The vertical fin is integral with the hull. Re-enforcing members run crosswise throughout the hull and particular attention has been given to the area extending from the bow to the step which is usually subjected to the greatest strain. Longitudial stringers are applied to the cross

members, giving the desired lines to the hull and permitting flat sheets of steel to be spot welded thereon. This not only provides the hull with an excellent streamlining but adds to its strength, durability and sturdiness. No protective paint is required although it can be applied if so desired. The ship's standard color is its natural finish which is comparable to chromium.

Wings are of the conventional type, constructed with two spars, drag wires and compression ribs; upper wing compression ribs are continued over the spars to carry alleron hinges. Leading edges of wings are covered with a thin sheet of steel. Covering is linen, doped and sprayed to the specified color. Inspection doors are provided. Two fuel tanks are located between the upper wing spars, one at the inner end of each panel. As the entire framework is of metal, the plane requires no bonding to permit the use of radio. Cables for navigation lights are installed.

Wing floats are bolted to the lower wing at four points, leaving no gap between the floats and the wing.

The BB-1 is powered with a Kinner 210 horsepower five-cylinder radial air-cooled engine equipped with an electric starter. The engine mounting ring is detachable from the main mount so that other engines may be installed if desired. The engine nacelle is streamlined by easily removable cowling attached directly beneath the wings.

Fuel lines from the two gravity gas tanks lead into a filter from which one line leads to the carburetor. Each tank has a capacity of twenty-two gallons. The gas gauge protrudes from the lower side of the left wing and is easily visible from the pilot's seat. The oil tank mounted behind the engine has a capacity of five and one-half gallons.

The pilot's cockpit is fitted with dual controls and provides for excellent visibility, easy access and exit. The instrument board comprises a complete set of instruments grouped in a most readable arrangement. The throttle is located in the center of the instrument board and the adjustable stabilizer control below the dashboard. The amphibion gear requires no effort to operate. Upholstery is of leather with sufficient padding to insure comfortable reclining seating arrangements. The passengers' cockpit has foot rests and the quarters are roomy and comfortable.

Horizontal surfaces are controlled by a stick and the rudder and tail wheel are controlled by a cross bar. The tail wheel is equipped with a spring mount. The wheel also acts as a rudder during water taxiing. The front stabilizer struts carry two streamlined surfaces which are adjustable in flight to any difference of balance caused by variable weights or uneven distribution. These streamline braces are controlled in the pilot's cockpit by a worm gear which is equipped with a dial showing the angle at which these struts face the wind. The elevator is controlled by two cables to the rear of the hull where they connect with a lever actuating a push and pull rod. There is a door at this point for lubrication and inspection purposes.

The simple retracting landing gear can be raised or lowered in one second from either of the front seats. Oversize tires and rubber shock cord, together with a long travel on the landing gear, smooth out the roughest landings.

With the standard model of the BB-1, the following instruments and accessories are installed; magnetic compass, tachometer, air speed indicator, altimeter, oil pressure gauge, lateral inclinometer, throttle lever, priming device, electric starter button, fuse box on dashboard, navigation and anchor light switches, Exide 12-volt battery.

# Specifications

Wing span......34 feet 1 inch Length overall......25 feet 8 inches Height overall......10 feet 3 inches Wing area (incl. ailerons) . . 292.4 sq. ft. Weight empty......1749 pounds Maximum load...........3300 pounds Wing loading ..... 9.1 per square foot Power loading . . . . . 12.7 per horsepower Maximum speed.....118 miles per hour Cruising speed.....100 miles per hour Minimum speed......55 miles per hour Climb, with 2,650 pounds.....760 feet Climb, with pilot alone......1250 feet Take-off with 2,650 pounds. . 14 seconds Take-off with 3,300 pounds...30 seconds Take-off, pilot alone, no wind. . 6 seconds

DECEMBER, 1931



# with LAND PLANE PERFORMANCE

The 10-12 place Douglas Amphibion issues a challenge to land plane performance and economy. The twin 300 h.p. engines carry a payload of 1845 pounds with a power loading of 14.2 pounds per horsepower. The Army rates its speed at 146 m.p.h. And in actual transport service these ships are operating for  $42\frac{6}{10}$  cents per mile gross. To this outstanding performance the Douglas Amphibion adds a plus value of quality construction that guarantees more continuous hours of service per dollar invested...and less depreciation write-off. Douglas Aircraft Co., Inc., Santa Monica, California

Amphibion custom built by DOUGLAS

# DIGEST OF FOREIGN TECHNICAL ARTICLES

# TAKE-OFF MEASUREMENTS

Take-OFF MEAGUREMENTS
Take-Off and Landing of Aircraft, D. Rolinson.
(British) Aeronautical Research Committee—Reports and Memoranda No. 1406, (Ac. 527), June.
1931, 25 pp., 26 figs.

T HE results of experiments made with a modified panoramic camera designed at the Royal Aircraft Establishment for measuring the take-off of airplanes are described. Runs of seven aircraft, four biplanes and three monoplanes were included. Lift and drag coefficients were calculated from the results obtained with the film records, and the Waniti and the Virginia, full-scale determination of the coefficients were made at a height of 2,500 feet for comparative purposes.

It was definitely established that an airplane could take-off and land at a speed much below that appropriate to the incidence obtaining, and that the lift coefficient for an airplane near the ground is much higher than would be expected for the same incidence in free air and steady flight. It was possible to obtain the distance necessary for a landing or take-off to be effected when a given height had to be cleared. It was also shown that it was within the power of the pilot to modify this considerably

The New Take-Off Measuring System of the DVL-Zeiss (Die neue Stratmesskammer System D.V.L.-Zeiss), O. Lacmann. Zeitschrift uruf Flugtechnik und Motorluftschiffahrt, Vol. 22, No. 13, July 14, 1931, pp. 401-405, 9 figs.

A SYSTEM developed by the Deutschen Versuchsanstalt fuer Luftfahrt for measuring the take-off and landing of airplanes, especially in making standard tests, is discussed in detail. The design of the 1927 model of the take-off measuring camera is taken up and reasons given for the alterations proposed for the new model. The firm of Carl Zeiss manufactured both devices. The weight of the new model is decreased by 44 per cent and the cost by twothirds of that of the previous model. The focal distance is increased from 25 to 40 centimeters.

# AIRSHIPS

The Theory of Elasticity of Rigid Airships (Elastizitätstheorie des starren Luftschiffs), H. Müller, and E. Seydel. Luftdartforschung, Vol. 9, No. 2, August 25, 1931, pp. 57-84, 67 figs.

FOR the static calculation of the supporting frame of rigid airships, the authors develop a method for the load acting in the average longitudinal plane of the ship. The determination of the rod stresses first render this method practical by the use of simplified assumptions, and these approximate values are then improved by considering the actual cross-section ratios

Calculations are given for single and three elastic cylindrical cellules between flat stable rings, for single conical cellules between flat rings, and for three elastical conical cellules fastened to a flat stable ring. The investigation of an intermediate ring, not braced in its flat surface, and possessing no

# Elsa Gardner

struts, was accomplished under the hypothesis that both the adjacent rings are rigid and remain flat with elastic deformation.

Report of the Deutschen Versuchsanstalt fuer Luftfahrt.

Tests on Biplane Fins on a Model of the R-101 Hull, R. Jones. (British) Aeronautical Research Committee—Reports and Memoranda No. 1379, (Ac. 504), October, 1930, 13 pp., 3 figs.

THE experiments described were carried out at the request of the Royal Airship Works at Cardington, in order to examine the feasibility of fitting airships with biplane fins constructed on the lines of airplane wings instead of with fins of the orthodox type. It was hoped that such fins would result in a saving of tail-structure weight. but it was realized that this could only be done provided that sufficient stability could be attained with fins of such a size that standard methods for the construction of airplane wings could be utilized. Biplane fins of R.A.F.-27 section were fitted to an existing model of the R-101 hull and compared with fins 3 of Reports and Memoranda No. 1168.

The permissible area of the biplane fins was much less than that of the standard fins that the stability of the model was reduced. Introducing turbulence at the nose of the model appeared to decrease fin efficiency, but improved the stability of the bare hull. The lateral force curves on the biplane fins were different in form from those on the standard fins and appeared more sensitive. Results show that it would not be advisable to construct biplane fins of this type on full scale unless they could be made larger.

## VIBRATION TESTS ON SPARS

Dynamic Fracture Tests on Airplane Framework (Dynamische Bruchversuche mit Flugzeugbauteilen), H. Hertel. Zeitschrite fuer Flugtechnik und Motorlutschiffahr, Vol. 22, Nos. 15 and 16, August 14 and 28, 1931, pp. 465-474 and 489-502, 44 figs.

TESTING devices and procedures developed by the Deutschen Versuchsanstalt fuer Luftfahrt for testing the vibration strength of airplane spars, with and without static loads, are described. Ten metal spars and spar parts, consisting of welded and riveted steel spars, steel spar framework, and duralumin spar framework, as well as two wooden spars, were tested up to fracture. The wooden spars displayed no reduction in the durability of the spar flange, compared with that of the working materials on the test stand. The durability for the metal spar, on the contrary, amounted to only a fraction of the value expected from the durability points of the working materials, because a local tension increase appeared which amounted to a multiple of the average tension fixed in the calculation.

The good results obtained with wooden spars were at the fixed cross-sectional parts, and stress arrangements and glued ioints were satisfactorily reduced for the working material. The unsatisfactory results with metal spars are shown in the detrimental increase of tension at the rough cross-sectional parts (butt straps and gusset plates), in the single and double rivetting, and in the detrimental effect of machining on the properties of the working materials used in construction.

# JAPANESE RESEARCH

The Japanese Research Institute. Aircraft Enneering, Vol. 3, No. 32, October, 1931, pp. gineering, Vol. 241-243, 8 figs.

THE aeronautical laboratory which was recently opened at the Tokio Imperial University is described. In addition to the new laboratory, the Aeronautical Research Institute is using the discarded Wammuva railroad tunnel which gives a straight run of 800 yards in air which is not subject to atmospheric disturbances. An experimental carriage is operated on the rails, carrying models for resistance measurements and full-scale propellers. Photographic investigations into vortex motions are also conducted in the tunnel. The functions and equipment of the chemistry, metallurgy, material, physics, instrument, physiology, wind-tunnel, airplane, and engine departments of the Institute are outlined.

### FRENCH YEARBOOK OF AERONAUTICS

The Aeronautical Year 1930-1931 (L'Année aéronautique), L. Hirschauer and C. Dollfus. Dunod, Editor. 422 pp., many figures and maps. A S usual this review of world aero-nautics, published under the auspices of the Société du Carburateur Zénith, starts off with illustrations and specifications of new airplanes, gliders, helicopters and engines, and tables giving the main specifications of equipment previously described. It is interesting to note, in comparison with last year's review, that while the number of new airplanes increased to 32, the number of engines decreased to 12. The outline followed in this review is much the same as last year's. The largest part is the second which covers the record-breaking flights, races and meetings. Under the heading of aeronautic industry, the third part is devoted to the aeronautical exhibitions in New York, St. Louis, Cincinnati, Detroit and Paris.

The fourth section of the review discusses the official organizations controlling aeronautical affairs in fourteen countries as well as in France. In the fifth section commercial aviation in 33 countries is reviewed with statistical data comparing the traffic of previous years with that of the present. The last section contains the addresses of aeronautical companies, clubs, and of publishers of aeronautical literature. An appendix is included containing an article entitled "Sport Flying and Carburetion."

### GERMAN RESEARCH

The 1931 Yearbook of the Deutschen Versuchsanstalt fuer Inftfahrt, W. Hoff, Editor. R. Oldenbourg, Munich, publisher. 745 pp., 1391 figs.

FIFTY-NINE aeronautical research reports issued by the Deutschen Versuchsanstalt fuer Lutfahrt during the period from April, 1930, to April, 1931, are given in this yearbook with a general discussion of the activities of the organization for the year. Progress made by the aerodynamic, static. engine material, aerial navigation, electrical engineering and radio, and flight divisions is outlined. The majority of the reports have been abstracted in preceding issues of Aero Digest from Zeitschrift fuer Flugtechnik und Motorluftschiffahrt, and Lutfahrtforschung. The aerodynamic and static reports not previously abstracted deal with the subjects of ventilation for engine test stands, trains driven by propellers, refrigeration apparatus of the DVL, load assumptions, stresses on airplane wings in squalls, strength of turnbuckles, long bolts in wooden structures, buckling of airplane connecting rods, shearing of corrugated plates, and four-flange trellises.

The engine reports include jet drive for arypanes, especially exhaust-gas jet-drive, superchargers, torsional oscillation in tandem engines, and the DVL torsiograph. Among the material reports are treated such subjects as welded steel tube production, static and dynamic properties of light metals, corrosion, test process, surface protection of rolled aluminum alloys against corrosion, enfluence of sodium chloride on corrosion, corrosion tests of wires, tests and test stand for airplane fuels. Aerial photography, navigating instruments, radiotelephony and telegraphy, and airplane stability are also among the subjects taken up in the reports.

# THE CAUSES OF PROPELLER VIBRATION

The Vibration Phenomena in Propellers (Uber die Schwingungsercheinungen an Luftscrauben), F. - wald. Zeitschrift für Flugtechnik und Motor-ustechiffahrt. Vol. 22, No. 12, June 29, 1931, pp. 369-374, 3 figs.

T HIS report of the Deutschen Versuchsanstalt für Luftfahrt discusses the phenomena of propeller vibration along lines
similar to those followed in the previous
report abstracted from Luftfahrtforschung
in the September, 1930, issue of AERO
DIGEST. In this case, however, the subject is dealt with in a more general way
and the present knowledge concerning the
vibration phenomena is reviewed without
original calculations. The author explains
combined trosion and bending vibrations, the
resonance between them and the excitation,
vibrations at large angles of attack, and
the influence of camber upon vibration.

In dealing with forced vibrations, he considers them due to the irregular operation of the engines, the burbling of the vortex hear the propeller blades which brings about the periodic variation of the air reaction, and the periodically varying feed of the blades caused by the irregularity of the stream in the propeller disk area.

### "FREE WHEEL" PROPELLER

The "Free Wheel" Paulian-Pillard Propeller for the Improvement of Right with Engine not Operating (L'helice "roue-libre" Paulian-Pillard pour l'amélioration du vol avec moteur arrêté), M. Pillard. L'Aéronautique, Vol. 13, No. 146, July, 1931, pp. 245-232, 23 figs., 2 tables.

THE inventor describes how he came to realize the possibilities of the "free wheel" type of propeller in flight when the engine stops operating, and explains the theory involved which is based on the formulas of Drzewiecki. He takes up the objections made to the Type A hub, describes the Type B hub with rachets, and illustrates the Type C hub now designed for wooden propellers, the Chauviere and Ratier duralumin propellers, and the Paulhan-Pillard hollow steel propellers.

Barograms obtained in flight tests with the Type C hub on the military seaplane Cams with two 500-hp. tandem engines are illustrated. Referring to them, the author points out the gain in pay load or ceiling obtained by the use of the "free wheel" device.

### AERODYNAMICS

Aerodynamic Actions Parallel to the Motion on a Plain Wing Animated by a Uniform Translatory Motion and by an Oscillating Motion, (Azioni aerodinamichi parallele al movimento su di un'ala piana animata da moto traslatorio uniforme e da moto oscillatorio), L. Poggi. Aerotecnica, Vol. 11, Nos. 6 and 7, Junc-July, 1931, pp. 767-779, 4 figs.

WHILE developing some formulas also calculates the average value for the component along the directions of the motion of aerodynamic action acting on an indefinite plain wing endowed with a uniform translatory motion and with an oscillating motion around a point on the chord of its prolongation.

The data is then further elaborated so that some populsive forces of the order of magnitude of the wing drag may be obtained in practice, but at the expense of the power necessary to put the wing in oscillation. This power is calculated according to the studies of Glauert, and from a comparison of this power and that of the propulsion, the efficiency is obtained with satisfactory results.

The Variation of Velocity in the Neighborhood of the Throat of a Constriction in a Wind Tunnel, T. E. Stanton. (British) Aeronautical Research Committee—Reports and Memoranda No. 1388 (Ae. 510), May, 1930, 3 pp., 2 figs.

R EFERENCE is made to Reports and Memoranda No. 1381 in which G. I. Taylor discussed the effect of the convex surface of a body, immersed in a stream of air, in raising the velocity in its neighborhood and, from approximate solutions, calculated the probable distribution of velocity in the neighborhood of a surface of given curvature. As the problem is closely related to that of the flow of air through a constriction in a parallel pipe in which the velocity distribution can be measured with fair accuracy, the experiments reported in the present report were made to find the extent to which Professor Taylor's solution applies to the three-dimensional case in practice.

The constriction used consisted of a sleeve.

2.8 inches in length, inserted in a 3.07-inch diameter parallel channel, and had a longitudinal section consisting of two circular arcs of 6.6-inch radius distant 2.77 inches apart. Observations reported by Professor Taylor in Reports an Memoranda No. 1382 are also checked.

Some Cases of Flow of Compressible Fluids, G. I. Taylor. (British) Aeronautical Research Committee—Reports and Memoranda No. 1382, (Ac. 507), February, 1931, 16 pp., 5 figs.

THE author refers to previous reports in which he showed that when a body moved through air at a speed less than, but comparable with, that of sound, irrotational motion ceased to be possible as soon as the speed of the body relative to still air attained some definite value which was always less than that of sound, but depended on the shape of the body. The essential difference between two cases was that in the first the velocity had a maximum value in the constriction, so that the pressure gradient was at right angles to the surface at the point of minimum pressure, whereas in the second. the speed increased and the pressure decreased continuously along all stream lines.

The hypothesis that this is the condition which differentiates between cases where the speed of sound may be attained and exceeded in a regular manner and cases where the speed of sound is the maximum which can be attained in irrotational motion, is tested in the present report. It is proved to be untrue by finding cases in which the speed of sound is attained and exceed in a regular manner in the region where velocity of flow is a maximum. The analysis leads to the prediction that a rapid thickening of the boundary layer might occur when the speed of sound is attained, this hypothesis fitting in with existing experimental knowledge.

# RACING ENGINES

The Rolls Royce Racing Engine. Aircraft Engineering, Vol. 3, No. 32, October, 1931, pp. 244-246, 8 figs.

DESCRIPTION of the experimental and development work involved in the evolution of the Rolls Royce engines for racing airplanes is given with details of the testing apparatus that was required. The S.1595 seaplane with a specially boosted R engine, said to develop 2,000 horsepower, recently made a new World's speed record of 408.8 miles per hour over a 3-kilometer course. The trouble experienced in getting the exhaust gases out of the test house is discussed, and reference is made to a special fan to produce 400 miles per hour for testing purposes.

The entirely new type of connecting rod developed is described as well as the very considerable modifications effected in the crankshaft and crankcase to withstand the terrific loads. The means taken to reduce the oil consumption and the difficulties experienced with spark plugs and magnetos are related. It is explained that due to the short life of the engines, forged aluminum was used to replace bronze and steel in many parts.

(Continued on following bage)

# ENGINE COOLING

Suggestions for the Cooling of Engines by the Circulation of Water (Suggestions pour le refroidssement des moteurs par circulation d'eau), Sales. L'Aéronautique, Vol. 13, No. 149, October, 1931, pp. 353-354, 5 figs.

THE author discusses various methods of cooling airplane engines and points out the necessity for an arrangement by which the pilot can regulate the cooling of the engine himself. He describes the mounting, regulation, and handling of a shunt which would branch out between the collector feeding the radiator and the suction pump. He considers that this arrangement would permit the pilot to divert to the radiator the exact quantity of water required to keep the engine at the best temperature for efficient operation.

WIND TUNNELS IN ENGLAND
The Compressed Air-Wind Tunnel of the National Physical Laboratory, E. E. Rell. Engineering, Vol. 132, No. 3429, October 2, 1931, pp.
428-433, 5 figs., 2 tables

R EASONS which led the National Physical Laboratory to build a compressed-air wind tunnel are discussed and the design and method of constructing the tunnel are described in detail. The selection of measuring instruments which would meet tunusual conditions of the wind tunnel is also taken up. The author relates how McKinnon Wood adapted the Goettingen return-flow type of tunnel to one which economized on space to the utmost by trans-

forming the return duct into an annular

He gives the results of tests carried out to see whether the diameter of the jet could be increased within the same limiting diameter of the outer shell, and describes an investigation to determine the correct design of an airscrew to circulate the air in the tunnel. He also refers to a type of balance controlled from outside the tunnel in such a way that it would indicate at any moment to an outside observer the forces acting on the model, and to a manometer for measuring the pressures in the tunnel.

Paper presented before the British Asso-

Experiments on Models of a Compressed-Air Wind Tunnel. R. Jones and A. H. Bell. (British) Aeronautical Research Committee—Reports and Memoranda No. 1355 (Ae. 486), April, 1928, 22 pp., 14 figs.

T HE report discusses experiments conducted at the National Physical Laboratory on a model of a compressed-air tunnel, now being erected there, in order to examine the uniformity of the flow of air in a suggested design, and to obtain an estimate of the power required to produce air currents of particular speeds. Part I deals with experiments on a model in which the outer shell was 9 feet long, while Part II describes the work carried out on the shortened model. It was found that the latter model could be adopted without any

detrimental effects and the the jet could be increased from 1 to 1.345 feet, without increasing the diameter of the shell. The power factor was improved on the short model to 1.95, a new airscrew being responsible for an increase from 1.5 to 1.7. The experiments gave an adequate indication of the lines along which the static pressure gradient could be altered in the full-scale tunnel if necessary.

New Wind Tunnels of the Royal Aircraft Establishment, R. McKinnon Wood. Engineering, Vol. 132, No. 3433, October 30, 1931, pp. 563-565, 1 fig.

MPROVEMENTS which are being made to the wind-tunnel equipment of the Royal Aircraft Establishment are discussed. The open-jet return circuit tunnel is being introduced in replacement of the National Physical Laboratory type of tunnel on account of the greater facility of access and observation, the much reduced power consumption, and the smaller space occupied. the last two factors permitting an increase in the scale of test which can be made in a given building. A tunnel of this type is to be built large enough to allow the speed and accuracy and analytical scope of the windtunnel method to be applied to actual fullsized aircraft. A new use of the wind tunnel is being introduced in the testing of model airplanes in free spins.

Paper presented before the British Association



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UNDREDS of EDO Floats are in service today. among them the first models which EDO designed and manufactured in 1026. This record is practical proof that EDO all-metal floats, with their trim, staunch construction, ease of maintenance and years of service, have abundantly met the requirements of airplane manufacturers, transport operators and private owners, EDO Float installations, interchangeable with wheel landing gear, are licensed for use in the United States or Canada on more than 40 distinct types of land planes-more than all other makes of floats combined.

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# Approved Type Airplanes Now in Production (Continued from Nov. Issue of Aero Digest)

S pecifications: Span, 57 feet. Length over-D pecifications: Span, 57 feet. Length over-all, 38 feet I inch. Height overall, 11 feet 6.5 inches. Wing area (including ailerons) 419 square feet. Pratt & Whitney Hornet engine of 575 horsepower. Weight empty, 4,504 pounds. Useful load, 3,247 pounds. Gross weight, 7,751 pounds.



# **AMERICAN** PILGRIM 100-A

American Airplane and Engine Co. Farmingdale, Long Island, N. Y.

Performance: High speed, 137 miles per hour. Cruising speed, 115 miles per hour. The fuselage is of welded chrome-molybdenum steel tubing, with removable engine section. The wings are constructed of built-up trusses of chrome-molybdenum steel tubing, heat treated after assembly, covered with fabric. The leading edge is covered with sheet dural. The ribs are a truss system formed of dural tubing The wing section is Goettingen No. 398 with an incidence of minus one degree, dihedral of 2 degrees and a sweepback of 3.5 degrees.

The landing gear is equipped with oleo shock absorber, in which a steel spring re-lieves the oleo action when taxying, 35 by 15 Goodyear tires, wheels and brakes. A tail wheel is used.

wheel is used.

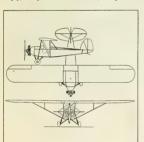
The Pilgrim accomodates nine passengers, baggage and 425 pounds of mail. Cargo space is located under the floor of the cabin. Useful load includes 120 gallons of

gasoline and 12 gallons of oil. The cabin is sound-proofed with cotton batting and, the windows being fixed, ventilated by Fokker ventilators.

Standard equipment includes retractible landing lights, Townend ring, and Hamilton-Standard propeller.



Specifications: Span, 37 feet 6 inches. Length overall, 20 feet 3 inches. Height overall, 7 feet 9 inches. Wing area, includ-ing ailerons, 184.65 square feet. Wing loading, 6.4 pounds per square foot. Power loading, 15 pounds per horsepower. Weight empty, 707 pounds. Useful load, 493 pounds.



# NICHOLAS-BEAZLEY NB TRAINER (NB-8G)

Nicholas-Beazley Airplane Co., Inc. Marshall, Mo.

Gross weight, 1,200 pounds. Powered with Armstrong-Siddeley Genet, Mark II, of 80 horsenower.

horsepower.

Performance: High speed, 110 miles per hour. Cruising speed, 93 miles per hour. Landing speed, 982 miles per hour. Rate of climb (fully loaded), 750 feet per minute. Take-off, full load, 300 feet. in 9 sconds. Landing, 150 feet in 5 seconds. Service ceiling, 18,000 feet.

The Trainer is a two-place, side-by-side,

high-wing monoplane, with cockpit entered by a step and door. Construction of wings is of wood, fabric covered, with plywood bracing and leading edge. Fittings are cad-mium plated throughout; no wires are used. Both wings are folding, swiveling on the hinge being provided by the rear spar fitting at the center section and the fuselage end

of the external lift strut. The fuselage is of welded chrome-molybdenum tubing throughout, hermetically sealed to prevent internal corrosion, with four linoil coats outside to prevent external corrosion. All parts that bear stresses and strains are heat-treated.

The propeller is a birch and walnut lami-nated wood, metal-tipped. This ship with its wings folded may be stored in a space 11 feet wide



pecifications: Span 35 feet. Length over-all, 24 feet 11 inches. Height overall, 9 feet 8 inches. Wing area, 288 square feet. Wing loading, 9.56 pounds per square foot. Fower loading, 11.47 pounds per horsepower. Wright Whirlwind R-760 engine of 240 horsepower. Weight empty, 1,870 pounds.



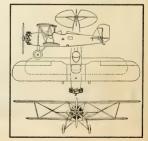
# STEARMAN BUSINESS SPEEDSTER Stearman Aircraft Co. Wichita, Kansas

Useful load, 884 pounds. Payload, (65 gallons fuel) 271 pounds. Gross Weight, 2,754

Performance: High speed, 136 miles per hour. Cruising speed, 110 miles per hour. Landing speed, 53 miles per hour. Rate of climb, 840 feet per minute. Service ceiling, 16,600 feet. Radius (65 gallons), 596 miles.

The figures given are for the Business Speedster de Luxe. The ship is also built in a Standard model and as a seaplane, with specifications and performance varying slightly from the figures above. Varying combinations of equipment and fuel capacity are offered. The fuselage is constructed of are othered. Ine tuselage is constructed of steel tubing covered with fabric. The wings and alierons are of spruce and plywood, fabric covered. Alierons are on the upper wing only. The N struts between the wings are adjustable. Fuel is supplied by a gravity tank in the center section. The plane is equipped with a Townend rink propeller is Hamilton-Standard. Landing gear is the split axle type with a tread of 7 feet 6 inches. Standard wheel brakes are furnished.

The Speedster carries three persons with baggage. Through conversion of the passenger cockpit, 26 cubic feet of cargo space may be made available.



# THE HAMILTON STANDARD PROPELLER COMPANY

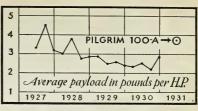
# **Announces**

the transfer of its activities from Pittsburgh, Pennsylvania, to East Hartford, Connecticut. In its new location, adjacent to Rentschler Field, the organization has excellent facilities for practical propeller flight testing. Hamilton Standard users who wish to visit the plant at East Hartford will find Rentschler field equipped with modern hangar and maintenance facilities.



HAMILTON STANDARD PROPELLER COMPANY
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DIVISION OF UNITED AIRCRAFT & TRANSPORT CORPORATION



Data from Aeronautics Bulletin No. 21 of U. S. Department of Commerce, covering all approved types of airplanes.

# PAYLOAD means INCOME HORSEPOWER means EXPENSE

MODERN AIR TRANSPORTATION requires every facility for comfort of passengers. Large cargo space for mail and baggage, and full equipment of the most modern aids to navigation, including complete twoway radio telephone and night flying equipment.

Maximum PAYload per Horsepower Means PROFIT PROFITABLE AIR TRANSPORTATION requires the moving of LARGE REVENUE PRODUCING LOADS swiftly from place to place, with a REASON-ABLE EXPENDITURE OF POWER.

# The IO PLACE PILGRIM IOO-A TRANSPORT AIRPLANE

carries, in addition to this complete equipment, a PAYLOAD of 2140 pounds at 2 miles a minute with a single engine of 575 H.P., and provides a cabin for 9 passengers in comfort a toilet compartment and 72 cubic feet of additional space for mail and baggage. That's why we say: "Developed to suit today's transportation needs—not designers' prejudice".

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Manufacturers of PILGRIM Airplanes and RANGER Engines.

# OUR READERS AIR THEIR VIEWS

P. E. Bewshea, of Imperial Airways, Ltd., amplifies Mr. Goldsborough's discussion of European airlines:

With reference to the article in your November issue by Paul Goldsborough entitled "Are European Air Lines Better than Those of the United States?" I am informed by Mr. Goldsborough that he did not intend his remarks to apply to this company. On all our planes, meals are served and a steward is in attendance on passengers all the time to serve drinks and take care of all the little details necessary for their comfort.

We also carry large quantities of mails, as was shown on page 82 of the same issue, in which there is a statement that we carried 5434 tons of letters on our Indian service alone, last year.

The loading of our machines is also strictly supervised under the Air Ministry regulations, and all passengers, baggage, and freight are carefully weighed so that the safety maximum is never exceeded under any circumstances. At times our mail load has been up to the limit and we have been obliged to refuse passenger bookings rather than overload.

I trust that you will be able to give prominence to these few facts, in order that there should be no misapprehension among your readers regarding our service.

May I take this occasion also to comment on another article in the November issue—"The Regulation of Aerial Common Carriers," in which the writer discussed the problem presented by state regulation of airlines. It is my opinion that in a few years we shall see the problem enlarged to include the international aspect.

One of these days we shall wake up with a foolproof airplane and all big operating companies will be scrambling over each other to begin operation of lines between Europe and America, and between America and the Orient. Operation rights will constitute one of the major problems.

In the future there must be a world association to settle the problems which will undoubtedly arise.

# Gene Redewill, of Phoenix, Arizona, urges a revival of the movement to air mark all towns:

I should like to air my views on cross country flying, from the standpoint of one who seeks new air lanes.

From the air the geography looks different from the same landscape visualized from the highways. The compass gives general direction, but every once in a while a city or village lcoms up in a position that is not reconciled on available aviation maps, road maps and distorted railroad maps.

Some years ago there was a movement to paint the names of towns on the roofs of the larger buildings. I find that only a comparatively few have names visible from a couple of thousand feet up. As a means of safety, not only to the fliers but to the inhabitants of the cities and country villages, this feature of air travel should be developed. When the gas gets low and darkness is coming on, it would mean safety to, everyone to have locations easily defined from the air.

My suggestion is this: That a movement be put under way to show every city, town, village that, as a means of safety to their inhabitants, they should have the name of their town on the four corners of the largest buildings on the outskirts of the town. Also—and this is most important—to facilitate the location of the town on the map, each town should have a number painted alongside the name. The maps should have the towns numbered as well as shown by name and thus the aviator could readily locate the town by number should he fail to do so by name.

William B. Alexander, sales manager of the J. B. Alexander Co., Van Nuys, California, makes some valuable suggestions to dealers considering entering the used plane business:

After reading several recently published articles I cannot refrain from expressing my sentiments on the efforts to urge new plane dealers to go into the used airplane business, and giving a few suggestions to assist them if they do enter the field.

In the first place the volume of sales in used planes at this time is too small to be of much importance. In the second place, ten to fifteen per cent is all an airplane owner should have to pay to dispose of his ship, and we have found that overhead and sales expense averages about twelve and a half per cent of the gross sales of used airplanes.

However, we are convinced from our personal experience that though on sales of used aircraft on a commission basis one can only break even, by buying for cash a satisfactory profit may be earned.

There are certain necessary factors in building up a successful business in used planes. A first class hangar for storage is necessary, as owners will hesitate to leave planes where there is a fire hazard. A large stock is an attraction, too. Next it is necessary to build up a large mailing list—a difficult task since the addresses of schools, operators and dealers change

rapidly. We find that a monthly bulletin, printed and mailed to this list, has proved valuable, and we also get out specials at times, when we have something to dispose of quickly. This entails some expense, of course, but it is our most direct means of reaching the market.

We have found that the most important job, in the used plane department is consigning the planes at a saleable price, or buying them far enough below the market price to enable selling them at a good profit. This margin of profit is necessary, of course, when planes are bought outright and stored until a purchaser is located.

One of the most necessary members of the staff of a used plane dealer is a man who is both a good pilot and a first class salesman, who can be on hand at the hangar all the time.

The more people who go into the aviation business the better, of course—but think it over and plan carefully before you start in the used plane business.

Hubert H. Echterling, parachute jumper of eleven years' experience, rallies to the defense of exhibition drops:

I wish to take exception to the article by Miss Elsie J. Miller. She says exhibition parachute jumps are detrimental to the advancement of aviation, and should be discontinued. I have been jumping since 1920. In this period of eleven years I have made a number of drops, most of which were exhibition drops in a certain sense of the word. However, every drop which I have made has been more or less educational and more or less an experimental affair. By this I mean that while I was actually being paid for the drop, I was also studying the action of my chute under a wide and varied state of conditions, as I usually jumped on schedule, regardless of weather. I can clearly recall a number of times when I had to fight my chute all the way down, first to make it open and then to make it stay open. The old time chutes were also a hard proposition

Of course there are a great number of drops which do not develop any special scientific value; however, we must not forget that if it had not been for the great number of drops made we would not have the present reliability in the various chutes manufactured today.

It took many drops to bring out the faults of the old time chutes. And as the chute of today is a highly developed article it will take many more drops in proportion to bring out one little fault or possible improvement.

# THE STUDENTS ARE THERE « «

Give them profitable, low rates which they can afford in . . .

(Two A. T. C.'s)



# THE ALEXANDER FLYABOUT

2-Seater Cabin Monoplane

Flyabouts are bringing schools healthy returns and many students. So low is the cost of a Flyabout, so low are the fuel costs and replacement risk that schools are making more money than ever at half the old rates.

# The Flyabout Is The Ideal Trainer

"The Flyabout is making the biggest hit of any plane I have ever seen. There is no question but that you have the best seller for the next year. We are giving instruction in this plane at \$12 an hour on the Flyabout and we filled our school in short order."

(Signed) Jake Pfaender, Hartley-Pfaender Aviation Co.

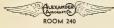
Duluth, Minn., Municipal Airport

"Have had our Flyabout just one week today and we are very well pleased with its performance. It exceeded our expectations twofold. Our students are also pleased with the ship and we doubled our enrollment in a week's time."

(Signed) Hennings & Simmerly Air Service, Kellogg, Idaho.

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# MAINTAINING THE HIGH STANDARDS

of the Industry

Hundreds of individual operations are performed daily in a shop such as ours. Some of these in themselves seem an insignificant part of the total necessary in the construction of an airplane engine—but each one individually assumes mighty importance, for one imperfection or a single carelessly performed operation has many a time spelled disaster.

Aviation has no place for imperfections. That is why engine manufacturers, whose strongest desire is to build a product as near mechanical perfection as possible, have come to Govro-Nelson for machinings and assistance in design.

Here, they realize, they may depend upon the finest equipment and skilled engineers whose watchword is precision. Send your blueprints or problems for advice and quotations.

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1931 ANTOINETTE DETROIT

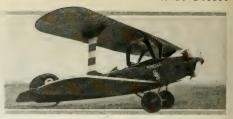
CRAFTSMEN TO THE AVIATION INDUSTRY

# THE UDET U-12 FLAMINGO

NE of the foreign planes in which considerable interest was displayed at the 1931 Cleveland National Air Races was the "Flamingo," designed and flown by the famous German war ace, Major Ernst Udet, a member of the international aerobatics team headed by Alford J. Williams of the United States. This ship is generally considered the best of the German machines for school and aerobatic flying. It is not, however, a recent development; about 80 of these ships have been constructed since it was first produced in 1925.

While a good deal of aerobatic work was executed by a number of pilots at the National Air Races, the type of maneuvers performed by Udet in the Flamingo attracted considerable comment because of the low power of this ship.
Udet made several loops with a dead stick at low altitude, flew the ship on its side, upsidedown, and in a number of other attitudes unexpected of a plane of such low horsepower. In view of the unusual maneuverability of the Flamingo, our readers will no doubt be interested in the various details of its construction and performance. In the accompanying three-view drawing, reproduced from the German technical magazine "Z.F.M.," all dimensions are given in millimeters; to convert these measurements to inches, multiply by 0.03937.

The U-12 Flamingo was designed and developed by the Udet Flugzeugbau, G.m.b.H., of München, Germany, which



ceased to exist in 1926 and was succeeded by the newly organized Bayerische Flugzeugwerke of Augsburg, Germany. The B.F.W. company, which took over the former works of the Bayerische Rumpler Werke at Augsburg, now produces a variety of aircraft types.

The B.F.W. U-12 Flamingo is a twoplace, dual control biplane with staggered, equal-span, single-bay wings braced with stranded steel cables. The wing framework is constructed of wood and covered with fabric. The top center section is supported above the fuselage on splayed-out inverted "U" type metal struts, with one "P" type built-up duralumin interplane strut on either side of the fuselage. The outer wing panels sweep back 3 degrees and have a 3-degree dihedral.

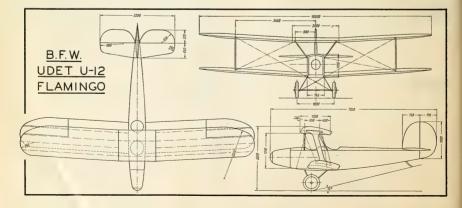
The framework of the ailerons is constructed of a steel tube spar and duralumin ribs, and is covered with fabric. The tail plane is of wood and fabric construction. The fin has a framework of wood covered with plywood. The rudder and elevators are of duralumin construction, with steel tube rudder post and elevator spar, covered with fabric. The fuselage has a rectangular structure of wood covered with three-ply plywood. The land-

ing gear is of the simple cross-axle Vee type with rubber cord shock absorbers.

The power plant is an air-cooled 7-cylinder Siemens Sh. 14 engine of 100 horsepower at 1650 r.p.m. The Siemens Sh. 11 powerplant of 84-96 horsepower may be installed if desired, with a consequent reduction in weights and performance. Fuel is consumed at the rate of .5 lbs. per h.p. per hour. Detachable steel tube motor mount is provided. Two main fuel tanks with a total capacity of 23.7 gallons are installed in the center section and the oil tank of 3.9-gallon capacity is installed in front of the fire-proof bulkhead. Dual controls are provided.

### Specifications

| Specifications                        |
|---------------------------------------|
| Span, both wings32 feet 10 inches     |
| Length overall 24 feet 7 inches       |
| Height overall 9 feet 2 inches        |
| Wing chord, both wings4 feet 2 inches |
| Wing area 258 square feet             |
| Gap 5 feet                            |
| Weight empty1,210 pounds              |
| Disposable load 550 pounds            |
| Weight loaded 1,760 pounds            |
| Wing loading6.8 lbs. per square foot  |
| Power loading16.3 lbs. per horsepower |
| High speed87 miles per hour           |
| Landing speed46 miles per hour        |
| Climb to 3,280 feet                   |
| Ceiling 12,500 feet                   |
| Take-off run                          |





FLEXIBLE—that's why GOHI Corrugated Culverts will not crack or break under the severe stresses of freezing, settling earth or landing impact of giant planes. Last years longer because made of GOHI Pure Iron-Copper Alloy, the metal that resists rust! Culverts in service for more than 20 years show little or no deterioration. Photo shows GOHI Culvert under 45 feet of fill. Write for details.

Gohi Culvert Manufacturers, Inc.





AN OLD-FASHIONED

# Christmas

AT Chalfonte-Haddon Hall Christmas is celebrated with a fine old spirit of good-will and good-cheer. There are tuneful carols . . . wreaths of holly . . . Christmas trees . . . stockings stuffed with surprises for the children . . . a plump family turkey for dinner. Here are all the joys of the old-fashioned Christmas—without the long hours of work and preparation.

Bring the children and spend a happy holiday week at Chalfonte-Haddon Hall. This is a grand place for overgrown grown-up families too. There are indoor recreations. There's the gaily decorated boardwalk. The bracing ocean air.

Your Christmas at Chalfonte-Haddon Hall will be cheery and economical, for 1931 rates are in effect. Write for information.

American and European Plans

# CHALFONTE-HADDON HALL

ATLANTIC CITY

Leeds and Lippincott Company



# LEARN TO FLY

For Sport and Business

Curtiss-Wright Flying Service is the world's oldest and greatest flying organization. It is backed by 20 years of experience training competent pilots.

Over 3,600 students learned to fly in the nation-wide chain of Curtiss-Wright Flying Schools during 1930. Not a single student has ever been seriously injured in the famous Fledgling, training plane.

When you finish Curtiss-Wright training, you will be recognized by the Aviation Industry as an accomplished pilot. You will be given preference as an applicant for employment in all Curtiss-Wright activities. Mail coupon for free booklet.

# WRITE FOR FREE BOOKLET



CURTISS-WRIGHT FLYING SERVICE, 29 West 57th St., New York City.

Please send me your new free booklet describing Curtiss-Wright Flying Courses.

City..... State.....

# Your choice of a school decides your future

HOOSING A SCHOOL is the first important step in your career in aviation—the judgment you use will be an indication of the judgment you will be *expected* to use as a pilot or mechanic.

The world's largest operators of air-mail and transport lines, combined with the largest aggregation of manufacturers of planes, engines and equipment, are the companies to whom student pilots and mechanics naturally look forward as furnishing their greatest opportunities for placement in aviation work.

And these companies are vitally interested

in developing the highest type of aviation training. United Air Lines, Pratt & Whitney, the Boeing Companies, Chance Vought, Stearman, Hamilton, Sikorsky—all these are part of the same organization that owns and operates Boeing School of Aeronautics.

Boeing graduates are not, of course, guaranteed or assured employment. But America's largest employers of pilots and trained mechanics, knowing Boeing School standards, look to Boeing School first... Catalog of courses, with entrance requirements, cost, full description of facilities, etc., will be mailed on request.

# BOE ING

Subsidiary of United Aircraft & Transport Corp.

| BOEING SCHOOL OF AERO<br>Room 12A, Airport, Oakland, C |                                                  |
|--------------------------------------------------------|--------------------------------------------------|
| Gentlemen: I am                                        |                                                  |
| ☐ Private Pilot                                        | ☐ Boeing Master Pilot                            |
| ☐ Limited Commercial Pilot                             | ☐ Boeing Master Mechanic                         |
| ☐ Transport Pilot                                      | ☐ Special Master Pilot<br>(For Transport Pilots) |
| Name                                                   | Age                                              |
| Address                                                |                                                  |
| City                                                   | State                                            |

# BOEING builds a bomber!





When a manufacturer of world-famous military pursuit planes decides to build a bomber, you naturally expect a departure from the ordinary. . . . Boeing engineers have, indeed, developed a bombing plane of radically new type. Designed to carry a crew of five and bombs weighing more than a ton, this twin-motored, all-metal monoplane takes off, retracts its landing gear and decidedly out-performs any other large bomber ever built! Boeing Airplane Company, Seattle, Subsidiary of United Aircraft and Transport Corporation.

# THE AIR SERVICES

# ARMY SETS SAFETY RECORD

T HE Army Corps set a new safety record during the fiscal year ended June 30, in flying 43,964,000 miles with only twenty-six fatalities. This represents a decrease of fifty per cent over the previous year when fifty-two army filers lost their lives.

The significance of this record is enhanced when the increase in mileage is considered. The increase of number of miles flown per fatal accident is 150 per cent. In 1930 the average miles flown per fatality was 68,000 miles; in 1931 the figure was 1,691,000 miles.

One of the outstanding achievements of the year was the completion of 4,000,000 miles by 670 airplanes in the Spring maneuvers, much of the time in close formation, without a single serious mishap. Taking into account the difficult nature of military flying, officials consider that the safety record set by the Air Corps compares favorably with civilian flying.

## Five-Lens Camera Maps Project at One-Thirtieth Usual Cost

THE Materiel Division, Wright Field, Dayton, Ohio, recently completed a successful experimental mapping project performed with the Air Corps five-lens camera in which half a year's work was completed in two flying days at one-thirtieth the usual cost.

The work was performed entirely at a high altitude, fifteen hours being flown at 20,000 feet. The equipment which permitted photography at this height made possible the mapping of 3,600 square miles in three



U. S. Army Air Corps photo

Second Lieut. H. G. Montgomery, Jr., West Point and Air Corps Flying Schools graduate, ready to go aloft with his dad, Capt. Montgomery, for a check flight hours of actual photographing.

The five-lens camera, designed at the Maleriel Division, is an unusual instrument because of the tremendously wide angle that it embraces for photographing terrain beneath. It is used in connection with a laboratory instrument which rectifies the wing pictures, enlarging them and projecting them to the horizontal plane at the same time. An improved film, which, exposed through a special filter, secures pictures farther than the eye can see, was also used in the project.

## Air Corps Tests New Plane Chute to Carry Cabin Down

THE Parachute Branch of the Materiel Division at Wright Field, Dayton, Ohio, under the supervision of Major E. L. Hoffman, has been conducting experiments to develop a parachute to be used in air transport to remove endangered passengers to safety. Rejecting the idea of a parachute to lower the whole plane, this group has been at work upon a chute which would lift the cabin from the plane and carry it to earth.

One model, eighty feet in diameter, has been tested by dropping 2,500 pounds of lead weight from a moving plane and by means of a glider, built in a similar fashion to that planned for use with the parachute, attached to the top of the center section of an airolane.

The parachute would be carried in the top of the cabin of a plane and would be released by a lever. Its weight would amount to thirty pounds per passenger seat and would cost about fifteen cents per day per passenger seat.

# Boeing Delivers Pursuit Planes

TWENTY-FIVE Boeing Wasp-powered pursuits have been delivered to Army Air Corps bases in the United States and last month thirteen more of the single-seater pursuits were completed and shipped to Hawaii and to the Philippine Islands from Seattle. Five planes were sent to the Air Corps base at Hawaii, while eight were routed to the Philippine Islands. Flyaway delivery of the Boeing pursuits was resumed at the end of the month.

### Akron Is Commissioned and Makes First Cruise

THE U. S. S. Akron, the Navy's huge airship, has been commissioned as a "ship of the line" and has made its first cruise.

The ship was delivered to Lieutenant Commander Charles E. Rosendahl, skipper, in ceremonies at Lakehurst, New Jersey, on October 26 and on November 2 the craft, the largest airship in the world, took off from its hangar at the naval air station

for its first jaunt.

The ship was escorted on her tour of Eastern seaboard cities by the Los Angeles, which trailed the bigger ship over Baltimore, Philadelphia, Washington and New York. Forty-nine civilian passengers were carried on the cruise.

# Berliner-Joyce to Build for Navy Eighteen Observation Planes

THE Berliner-Joyce Aircraft Corporation of Baltimore will build eighteen convertible observation planes for the Navy Department. The contract recently awarded is for \$463,700.

These planes, of the type known as XOJ-1, are being built to supply the need for a lighter plane for observation purposes and one which can operate from either land or water. The new plane is capable of being operated either from the catapult of battleships and cruisers as a seaplane or as a landplane on carriers. It accommodates a pilot and an observer.

### New York Reserves Get Trophy

The Herbert Schiff Trophy, awarded annually to the naval aircraft squadron or unit flying the greatest number of hours without serious accident to personnel or material has been awarded to the U. S. Naval Reserve Aviation Base, Floyd Bennett Field, Brooklyn, New York.

The trophy will be presented to Lieutenant Richard F. Whitehead, commander of the base, by President Hoover some time in December.

The New York Reserve unit flew in the year ending June, 1931, 3,441 hours, more than 300,000 miles, without accident. Approximately fifty naval reserve aviators are performing flying duty at the Floyd Bennett Field.

This is the first time that the trophy has been won by a reservist unit. Last year's winners were the navy pilots, "The Striking Eagles," aboard the aircraft carrier Lexington.

The first Marine Corps airplane squadrons organized for duty afloat have been commissioned and attached to the U. S. S. Lexington and Saratoga. These two squadrons composed of six socuting planes each, will be units of the regular operating aeronautical organization of the Navy and have been added to the aircraft squadrons of the fleet to give aviators of the Marine Corps actual experience in carrier operations.

### Curtiss Delivers Observation Planes

SEVERAL of the new Curtiss O39 observation planes, ten of which were recently contracted for, have been delivered to the Air Corps.

This ship is the Curtiss Falcon of the O1 type modified to provide a high-powered, speedy observation plane. The new ship is powered with a Curtiss Conqueror, Prestonecooled engine and has a speed of 135 miles per hour.

Improvements include a cockpit "cover" for the pilot and observer, a new type, flexible gun mount, dashboard parking brake for use in warming up the engine, and refinements of the instrument board, such as an inspection panel and sinking of the instruments into a padded leather panel.

### War Birds to Assemble

PLANS are being formulated to hold a reunion of World War Birds during the Fourth Annual Miami All-American Air Races, January 7-9, 1932.

Each year the various squadrons of the Air Service A. E. F. have held individual reunions, usually on Armistice Day. The plan arranged by officials of Miami is to consolidate the reunions for 1932 into one event, at which all the fliers should be pres-

War Birds who attend will be the guests of the city and hotel accommodations and entertainment will be furnished.

The committee appointed by the mayor of the city to formulate arrangements is composed of L. C. (Red) Simon and W.

G. (Bill) Schauffler. Fliers planning to attend should communicate with this committee.

# Hell-Divers Are Delivered

HREE Curtiss Hell-Divers have been added to the aerial equipment of the naval reserve squadron at Oakland municipal airport. The planes were ferried from the factory by Lieut.-Com. F. B. Connell and Lieuts. J. W. Hughes and J. G. Von Adelung. During the return flight to Oakland, the officers made a tour of naval reserve bases throughout the nation, flying a total of 3,400 miles.

The additional equipment gives the squadron ten planes, including six Hell-Divers.

# N. Y. Reserve Installs Radio

A FTER three months of diligent work. the Naval Reserve Base at Floyd Bennett Field has successfully completed the installation of a very complete and efficient radio station for the purpose of intercommunicating with planes as well as Naval and Naval Reserve shore stations.

There are three separate transmitters and receivers. The main net covers the aircraft frequencies; the second set-now being used by the station personnel to compete for the Communication Trophy-covers the short wave band of from 20 to 80 meters, and the third unit consists of a radio telephone receiver and transmitter. The telephone transmitter is primarily used for squadron commanders to direct maneuvers and formations of planes flying in the vicinity of the field.

Reliable daylight communication was kept up between planes in the air and Floyd Bennett Field for distances up to 180 miles. Reliable transmission in day time has been carried on between Floyd Bennett Field and Anacostia, a distance of approximately 215

# Martin Company to Build Bombers

THE Glenn L. Martin Company, aircraft manufacturers, Baltimore, Md., has been awarded a contract for sixteen of the new type diving bombers by the United States Navy, according to an announcement of Charles A. Van Dusen, vice-president and general manager. The contract, together with spare parts, involves a little over \$535,000

Twelve of the planes already are under construction at the Martin plant. They constitute the latest in naval aerial equipment and were developed by the Bureau of Aeronautics of the Navy Department and the Martin Company. The first of the original order of twelve bombers now are being delivered and all will be out of the shop by January.

Delivery of the first of the sixteen bombers under the new contract is scheduled to begin next March and all will be delivered by June 1.

## New Boeing Fighters Delivered

THIS month the first new-type Boeing Wasp-powered Navy fighter will be completed and delivered to Anacostia, D. C., according to the production schedule at the Boeing Airplane Company, which is building seventy-five Wasp-powered fighters for the Navy. Twenty more of these airplanes will be completed in January, it was reported.

Twenty-four new two-seated pursuit planes have been delivered to Selfridge Field, Mt. Clemens, Michigan, to be tried out to determine how they can be used to the greatest advantage. Forty-five new single seaters are to be delivered, beginning in November.

# Navy Contracts for Stanavo

A CONTRACT was recently awarded by the Navy Department for 858,000 gallons of Stanavo Aviation Gasoline, of which 723,000 gallons will be delivered by Standard Oil Company of New Jersey, 85,000 by Standard Oil Company of Pennsylvania, and 40,000 by Colonial Beacon Oil Company. Deliveries will be made to Naval Stations at Anacostia. Annapolis, Boston, Squantum, Hampton Roads, Philadelphia, Brooklyn, New York Harbor, and to the Navy Proving Grounds at Dahlgren, Va. Part of the supply scheduled for Hampton Roads and New York Harbor is to be delivered in bulk by barges to navy vessels at Government docks or within harbor limits, this method being followed in fueling the Navy's aircraft carriers, the Lexington and Saratoga, and other navy vessels maintaining flying equipment.

# New Boeing Bombers Ordered

FOLLOWING demonstration of the experimental model this summer, the Army Air Corps awarded a contract to the Boeing plant for seven bombardment planes of a radically new type, having a much greater speed and higher ceiling than any bomber previously built. The first two planes have been delivered to Wright Field, Dayton, Ohio.

The first plane to be completed was powered with two 575-horsepower geared Hornet engines, while the second is equipped with liquid-cooled Conqueror motors. Ring cowls are installed on the air-cooled engines. The results of comparative tests of the two bombers will determine what type of power plants will be used on the remaining five bombers of the contract.

Distinctive features of the new Boeing bombing plane include the slender cigarshaped fuselage and the complete streamlining, which is emphasized throughout the plane. The landing gear is retractable. The plane carries two gunners, pilot and co-pilot, and a radio operator. Bombs totaling 2,400 pounds in weight can be carried externally between the landing wheels.

The bomber has a wing span of 76 feet and is 51 feet in length. Entirely of metal construction, the low-wing monoplane is chiefly fabricated of duralumin,

### Wright Field Construction

CONSTRUCTION work on nine new buildings for Wright Field, Dayton, Ohio, has been started, the Air Corps has announced. These include a torque stand, oil storage building, aerial way inclosure, dynamometer storage, ammunition magazine building, short wave beacon building, tool and process building, repair construction for generator power house, and Maintenance Building No. 2. It is expected these buildings will be completed by the first of the vear.



Congressman W. Frank James (right) with Lt. Col. Barton K. Young on an inspection tour of army flying fields

# AERONAUTICAL INDUSTRY

# EVENTS ANNOUNCED IN MIAMI AIR RACES

THE sum of \$10,000 has been set aside cash prizes at the fourth annual Miami All-American Air Races to be held in Miami, Florida, January 7-9, 1932.

One of the trophies to be awarded for the first time this year is the Colonel Green Star Island cup, a trophy valued at \$6,000. Details of competition have not been competed, but the cup will be an annual trophy and the winner each year will receive a fourteen-inch silver replica. The Freddie Lund Memorial Trophy, to be given each year, will be for precision and safety in acrobatics.

One of the outstanding features planned is the re-enacting of a Zeppelin raid on a French village at night. Competition events include a fishing contest in Bascayne Bay between an autogiro and a blimp; a barpooning contest for amphibions, in which each takes off accompanied by an experienced harpooner, flies to the Bay or the Gulf Stream, harpoons a fish and returns to the field; and a hunting race for amphibions, in which each contestant, carrying a Seminole Indian guide, flies out into the Everglades, shoots some kind of game and returns.

Representatives of Central and South American countries are expected to be present, giving the races the Pan American aspect that grows more pronounced each year. A generous military representation has been promised.

Special hotel rates for pilots and mechanics will be in effect again this year, and gasoline and oil will be supplied without charge.

# W. E. Boeing Again Offers Aviation Scholarship

A NATIONWIDE competition among college undergraduates for the third annual W. E. Boeing Aviation Scholarships at the Boeing School of Aeronautics has been announced by officials of the school, located at Oakland, Calif. The four scholarships awarded to successful candidates in an essay competition have a total cash value of \$7.345.

The first award is a complete Boeing master pilot ground and flying course, valued at \$5,275. Winners of the second, third and fourth awards will choose between the master mechanic ground course, and the private pilot ground and flying course. The competition closes May 15, 1932. College undergraduates interested in the Boeing Scholarships may obtain complete information through the office of their Dean or by writing directly to the Boeing School of Aeronautics.

THE number of licensed pilots in the United States on October 1, 1931, showed an increase over the number licensed on July 1, according to Department of Commerce reports. In October there were 17,242 pilots, 10,099 aircraft and 9,166 mechanics holding active licenses. The earlier figures were 16,268 licensed pilots, and 10,235 licensed aircraft. Figures show a decrease of fifty-six in the number of licensed mechanics.

UNITED AIRCRAFT & Transport Corportation reports net income for the third quarter of \$742,567.73, after providing for taxes, depreciation and minority interests, which, after deducting \$180,000 for preferred dividend requirements, equals 27 cents per share, on 2,084,192 common shares outstanding September 30, 1931.

THE United States and Italy have entered into a reciprocal air navigation arrangement which provides for the navigation of civil aircraft of the one country in the other, the issuance by each country of pilot licenses to nationals of the other, and the acceptance by each country of certificates for aircraft accessories exported from the other as merchandise. The agreement went into effect on October 31.

# **Amateurs Will Race to Miami**

THE New York to Miami Amateur Cruising Race, sponsored by the United States Amateur Air Pilots' Association, is scheduled to leave from some field in Long Island on January 3, proceed in easy stages down the coast, and arrive at Miami on the 7th, the opening day of the Miami All-American Air Races.

Overnight stops will be made at Richmond, Va.; Pinehurst, N. C.; St. Simonds Island, Ga., and Palm Beach, Fla.

The Amateur Air Pilots' Association will conduct all amateur events at the Miami Air Races. Entries are now being accepted for the Cruise and for events at the Races. Arrangements have been made to reserve the top floor at the McAllister Hotel, where cruise members will be given rooms at \$1.00 per day per person. Cruise members will receive guest cards at most of the better beach and country clubs in Miami.

Dinner parties, duck shooting, yachting parties and other such events have been arranged on the Cruise and at Miami.

HAVEN B. PAGE, founder in 1927 of Air Associates, Inc., has resigned his office with that company and joined the firm of Aviation Protection, Inc., insurance brokers, of which he has been a director since its organization in 1928.

# EYESIGHT REQUIREMENTS NOW LIBERALIZED

A LIBERALIZATION of the Department of Commerce eyesight requirements for student and private airplane pilot licenses, which will permit and at the same time require student and private pilots with defective vision to wear correcting lenses while operating aircraft, was announced recently by Clarence M. Young, Assistant Secretary of Commerce for Aeronautics.

"The action of the Aeronautics Branch of the Department of Commerce in liberalizing its requirements with respect to vision for student and private pilots," Colonel Young explained, "will be of interest and importance to many thousands of persons throughout the United States. Our records show that under the old requirements for vision more than 5,000 persons were disqualified for student and private pilot licenses since 1928. In addition to this number, there doubtless are thousands of persons whose vision requires correcting lenses and who, because of this, never reached the stage of taking the physical examination for flight training.

"Under the new requirements, which are effective at once and are embodied in amendments to the Air Commerce Regulations, if an applicant's vision without glasses does not meet the requirements of 20/50 in either eye or if his depth perception without glasses is more than 30 millimeters, he may be issued a student permit qualifying him for the grade of private pilot if his vision in each eve corrects to 20/30 or better by spectacles or correcting lenses in his goggles and his depth perception is not more than 30 millimeters while wearing such correction. (The fraction 20/30 means that at a distance of 20 feet from the vision-test letters, a person can read what an individual with normal evesight should be able to read at 30 feet. Depth perception is the ability of the individual to judge distances accurately.)

"In presenting themselves before the medical examiners of the Aeronautics Branch, who are located throughout the United States and number more than 800, applicants must possess the spectacles or goggles with correcting lenses fitted therein and must use them while taking the visual and death percention tests.

The action is applicable only to student and private pilots and does not permit them to progress to higher grades of licenses.

#### DIGEST OF RECENT EVENTS

A Brief Chronological Summary of the Month's Important Aeronautical News

#### Sailflight Commission Meets

(England.) The International Sailflight Study Commission met at London in a twoday conference to consider important technical and sporting matters. (Oct. 1-2.)

#### Two Months' Service Cruise

(Egypt.) Four day bombers of the Royal Air Force left Cairo on a service cruise of more than 11,000 miles across Africa to occupy almost two months' time. Fairey-Napier planes are being used. (Oct. 14.)

#### Distance Record

Miss Ruth Nichols completed a non-stop distance flight of 1,977 miles from Oak-land, Cal., to Louisville, Kentucky, breaking the record of 1,810 miles held by Mlle. Maryse Bastie, French aviatrix. The record has since been approved by the Federation Aeronautique Internationale. (Oct. 26.)

#### Akron is Commissioned

The airship Akron was commissioned at Lakehurst, N. J., as a "ship of the line" of the United States Navy and delivered to the command of Lieut. Commander Charles A. Rosendahl. (Oct. 27.)

#### Hinkler Flight

(Jamaica.) Bert Hinkler, Australian flier, arrived at Kingston, Jamaica, on the first non-stop flight from New York, making the 1.678 miles in eighteen hours. (Oct. 27.)

#### Thirty-two Hour Flight

(Egypt.) Squadron Leader O. R. Gayford and Flight Lieutenant Bett landed at Abu Sueir, Egypt, after a 2,857-mile flight from Cranwell, England. They were in the air thirty-two hours. (Oct. 28.)

#### E. A. T. Passes Milestone

Eastern Air Transport passed the 2,000,-900 pound mark for air mail transported over its route between the North and South. The company has flown 6,549,200 miles on schedule. (Oct. 31.)

#### U. S.-Italian Air Treaty

A reciprocal air navigation arrangement between Italy and the United States became effective. Recognition of each other's licenses and certificates and a definition of rights constitute the principal items of the agreement. (Oct. 31.)

#### South American Airlines

The last gap in American airlines encircling South America was closed when a Pan American Airways took off for the south, flying down the east coast by way of Santos, Florianopolis, Rio Grande do Sul, Porto Alegre and Montevideo to Buenos Aires. Schedules provide for one trip each way every week. (Nov. 2.)

#### Randolph Field Opens

Randolph Field, the Army Air Corps' ten million dollar training center at San Antonio, Texas, went into commission with the admission of the first class of 200 students. The field occupies 2,300 acres and has been under construction for two years. (Nov. 2.)

#### Akron Cruises

The Akron, the new navy airship, made a voyage of 500 miles carrying 107 persons and visiting Washington, New York, Baltimore and Philadelphia. (Nov. 2.)

#### Aviation Anniversary

The day represented the twentieth anniversary of the completion of the first transcontinental flight, made by Galbraith Rodgers in 49 days. He flew from New York to Pasadena, California, cracking up and rebuilding his plane several times en route. (Nov. 5.)

#### Aviatrix Breaks Record

(Africa.) Miss Peggy Salaman, London debutante, arrived in Capetown after a flight of five days and six and one-half hours, which established a record from London to Cape Town. The previous record was six days, eighteen hours. (Nov. 5.)

#### Record to Australia

(Australia.) C. A. Butler, English aviator, landed at Port Darwin, having set a new record from England to Australia. He flew a Compton Swift, a light plane with a wing span of twenty-one feet. (Nov. 9.)

#### Squadron Trophy Awarded

Announcement was made of the award of the Herbert Schiff Trophy, for the aircraft squadron or unit flying the greatest number of hours during the year without serious accident, to the U. S. Naval Reserve Aviation Base, Floyd Bennett Field, Brooklyn, N. Y. (Nov. 15.)

#### Air Show Held

The second Annual Baltimore Aircraft Show and Industrial Exhibition was held at Service Field Airport, Baltimore, Maryland. (Nov. 15-22.)

#### American Clipper Makes Voyage

The American Clipper, new forty-twopassenger Sikorsky amphibion recently purchased by the Pan American Airways, made her maiden flight, piloted by Col. Charles A. Lindbergh, from Miami to Cienfuegos, to open a direct Cuba-to-South America air mail service. (Nov. 17.)

#### Relief Air Show

Famous pilots competed in a two-day air show at Glenn Curtiss Airport for the benefit of the New York American Christmas and Relief Fund. (Nov. 21-22.)

#### Glider Contest

(Hawaii.) Under the auspices of the Honolulu chapter of the N. A. A., international gliding competition was being held at Honolulu. (Nov. 22-Dec. 5.)

#### NEW ENGLAND GLIDER ASSOCIATION PROPOSED

WHAT is expected to be of valuable assistance to glider clubs in New England and to the general development of gliding in that section of the country, is the proposed New England Glider Association, plans for the organization of which are progressing rapidly. Under the leadership of the Glider Section of the Rhode Island Aviation League, a successful Rhode Island glider club sponsored by the Providence Chamber of Commerce, several of the foremost clubs in New England have agreed to form an association and have invited other clubs in the several states to join with them. A first meeting has been called for December 12 in Providence.

The Glider Section's facilities, which include an adequate, well-lighted steel hangar erected on Rhode Island's new IS8-acre state airport, primary and utility gliders and equipped for towing and shock-cord launching, have been placed at the service of the association.

The clubs already supporting the plans for the New England association, in addition to the Glider Section, are the Franklin Glider Club of Greenfield, the South Shore Flying Club and the Gardner Glider Club of Gardner, Mass.

CIVIL aeronautics in this country is a transportation system involving the flying of nearly 40,000,000 miles a year by scheduled air transport services and more than 100,000 miles by miscellaneous operators; a manufacturing industry in which more than \$60,000,000 worth of aircraft, parts and accessories are produced in a year, as well as a sport in which thousands of aircraft and pilots are taking part, according to "Civil Aeronautics in the United States," a bulletin recently issued by the Aeronautics Branch of the Department of Commerce.

The publication, which is Aeronautics Bulletin No. 1, is available free upon request to the Aeronautics Branch, Department of Commerce, Washington, D. C.

THE Sperry Automatic Airplane Pilot, which recently was installed and demonstrated on an eighteen passenger Curtiss Condor of the Eastern Air Transport System, has been officially sanctioned for use in regular air transport services by the Department of Commerce, it was announced by the transport company today.

The Sperry Pilot is a gyroscopic control which makes instant corrections for all effects of air currents and shifting of weights upon an airplane, and keeps the craft flying in a perfectly level position on a true course.

DETROIT has been selected again as the host city to the Aircraft Show of 1932, to he held from April 2 to 10, according to a release from the Aeronautical Chamber of Commerce of America, Inc.

Ray Cooper, who directed the National Show of 1931 and the All-American Aircraft Shows of 1928, 1929 and 1930, has been appointed manager of the Show Section of the Aeronautical Chamber of Commerce and will have charge of the coming exhibi-

This is the second consecutive year in which the Show will be held in Detroit. the principal reason for the selection being the huge exposition hangar available and the nearby airport, which offers the advantage of demonstration opportunities.



"Time Builder" Plane Made for Students

FOR pilots of limited experience who must "build up time," the single-place, high-wing monoplane "Time Builder" has been produced by Hayden & Clark, Visalia, California. This light plane, powered with a forty-horsepower Salmson engine, is economical in operation.

Its specifications are: Span, 32 feet; area, 160 square feet; weight empty, 684 pounds; gross weight, 925 pounds; speed range, 80 to 85 miles per hour; cruising range 250 miles

THE Waco Aircraft Company has completed a contract with the Varney Aircraft Corporation of Oakland, California, for the exclusive handling of Waco products in the northern portion of the state.

The Varney company will immediately be in a position to make demonstration on all current models and to handle Waco service for any owners within their territory.

THE General Electric Company is taking to the air to demonstrate its aeronautic devices and instruments. A Stinson-Wasp Junior cabin monoplane was ordered for delivery in November for use in promoting the sale of aeronautic devices. On it will be mounted a complete line of General Electric equipment for aircraft, in order to demonstrate the various instruments and devices to prospective customers. The plane is powered with a 300-horsepower Pratt & Whitney Wasp Junior engine with a General Electric supercharger.

THE Ford Motor Company, Airplane Division, today delivered a standard 5D tri-

#### COMING AERONAUTICAL EVENTS

Nov. 30-Dec. 4. Annual meeting American Society of Mechanical Engineers. New York.

December 10. Dedication of Gulf States Steel Company Airport at Gadsden, Ala.

December 12. Meeting sponsored by the Glider Section of the Rhode Island Aviation League for the purpose of organizing an association of glider clubs in New England.

December 17. Celebration of the twenty-eighth anniversary of the first flight, made by the Wright Brothers at Kitty Hawk, North Carolina.

January 3-7. New York to Miami Amateur Cruising Race under the auspices of the United States Amateur Air Pilots Association.

January 7-9. Miami All-American Air Races, Miami, Florida.

January 14. Annual Dinner of the S. A. E. Pennsylvania Hotel, New York.

January 25-29. Annual Meeting of the S. A. E., Book-Cadillac Hotel, Detroit, Mich.

April 2-10. National Aircraft Show of 1932, sponsored by the Aeronautical Chamber of Commerce of America, Inc., in the Expositions Hangar, City Airport, Detroit, Mich.

motor Ford passenger plane to National Air Transport. The plane is to be used to augment the fleet of Ford planes now in operation over the company's New York-Chicago division. The delivery brings to twenty-two the total of Ford planes purchased for the National Air Transport fleet. The plane is equipped with mail compartments in the wing tips.

#### Department of Commerce Reports on Aircraft Production

AIRPLANES manufactured in the United States during the first nine months of 1931 totaled 2,321, according to a survey made by the Aeronautics Branch of the Department of Commerce and announced recently. These craft included 1.583 manufactured for domestic civil use, 637 military deliveries, and 101 exported to foreign countries.

The airplanes built for domestic civil use included 1,130 monoplanes, 399 biplanes, 52 autogiros and two helicopters. Of the monoplanes, the majority were landplanes of the

one or two-place open-cockpit type, and of the biplanes, the majority were either two or three-place open-cockpit landplanes.

The full report on aircraft production for the first nine months of the year follows:

#### MONOPLANES

| Open Cockpit (Landplane)                                                                                                                                                                                                          |                                                                            |           |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------|
| Open Cockpit (Landplane)                                                                                                                                                                                                          |                                                                            |           |
| One Place                                                                                                                                                                                                                         | 266                                                                        |           |
|                                                                                                                                                                                                                                   | 543                                                                        |           |
| Three Place                                                                                                                                                                                                                       | 11                                                                         | (2        |
| Four Place                                                                                                                                                                                                                        | 2                                                                          | ( 0       |
|                                                                                                                                                                                                                                   |                                                                            |           |
| Total Open                                                                                                                                                                                                                        | 822                                                                        |           |
| Cabin (Landplanes)                                                                                                                                                                                                                |                                                                            |           |
| One Place                                                                                                                                                                                                                         | 5                                                                          |           |
| Two Place                                                                                                                                                                                                                         | 32                                                                         |           |
| Three Place                                                                                                                                                                                                                       | 10                                                                         |           |
| Four Place                                                                                                                                                                                                                        | 128                                                                        |           |
| Four Place                                                                                                                                                                                                                        | 4                                                                          | (b        |
| Six Place                                                                                                                                                                                                                         | 13                                                                         | (a        |
| Seven to Ten Place                                                                                                                                                                                                                | 40                                                                         | (0        |
| Over Ten Place                                                                                                                                                                                                                    | 47                                                                         | (d        |
|                                                                                                                                                                                                                                   |                                                                            |           |
| Total Cabin                                                                                                                                                                                                                       | 279                                                                        |           |
| Convertibles                                                                                                                                                                                                                      | 6                                                                          |           |
| Amphibions                                                                                                                                                                                                                        | 16                                                                         | 1.        |
| Monoplane for which data as to                                                                                                                                                                                                    |                                                                            | (1        |
| place, etc., not available                                                                                                                                                                                                        | 1                                                                          | <b>(1</b> |
| Seaplanes                                                                                                                                                                                                                         | - 6                                                                        | (1        |
| ocupanies                                                                                                                                                                                                                         |                                                                            |           |
| Total Monoplanes1                                                                                                                                                                                                                 | ,130                                                                       |           |
| BIPLANES                                                                                                                                                                                                                          |                                                                            |           |
| Open Cockpit (Landplane)                                                                                                                                                                                                          |                                                                            |           |
|                                                                                                                                                                                                                                   |                                                                            |           |
|                                                                                                                                                                                                                                   |                                                                            |           |
| One Place                                                                                                                                                                                                                         | 36                                                                         |           |
| One Place                                                                                                                                                                                                                         | 141                                                                        |           |
| One Place<br>Two Place<br>Three Place                                                                                                                                                                                             | 141<br>159                                                                 |           |
| One Place                                                                                                                                                                                                                         | 141<br>159<br>28                                                           |           |
| One Place<br>Two Place<br>Three Place                                                                                                                                                                                             | 141<br>159<br>28                                                           |           |
| One Place. Two Place. Three Place. Four and Five Place. Total Open.                                                                                                                                                               | 141<br>159<br>28                                                           |           |
| One Place                                                                                                                                                                                                                         | 141<br>159<br>28<br>364                                                    |           |
| One Place. Two Place. Three Place. Four and Five Place. Total Open.                                                                                                                                                               | 141<br>159<br>28                                                           |           |
| One Place                                                                                                                                                                                                                         | 141<br>159<br>28<br>364                                                    |           |
| One Place Two Place Four and Five Place  Total Open  Cabin (Landplane)  Four to Seven Place  Total Cabin                                                                                                                          | 141<br>159<br>28<br>364<br>26                                              |           |
| One Place Two Place Four and Five Place  Total Open  Cabin (Landplane) Four to Seven Place  Total Cabin  Amphibions                                                                                                               | 141<br>159<br>28<br>364<br>26<br>26                                        |           |
| One Place Two Place Four and Five Place  Total Open  Cabin (Landplane)  Four to Seven Place  Total Cabin                                                                                                                          | 141<br>159<br>28<br>364<br>26<br>26                                        |           |
| One Place Two Place Four and Five Place  Total Open  Cabin (Landplane) Four to Seven Place  Total Cabin  Amphibions                                                                                                               | 141<br>159<br>28<br>364<br>26<br>26<br>. 3                                 |           |
| One Place. Two Place. Three Place. Four and Five Place.  Total Open.  Cabin (Landplane) Four to Seven Place.  Total Cabin.  Amphibions Seaplanes  Total Biplanes.                                                                 | 141<br>159<br>28<br>364<br>26<br>6<br>. 3<br>399                           |           |
| One Place Two Place Three Place Four and Five Place  Cabin (Landplane) Four to Seven Place  Total Cabin  Amphibions Seaplanes  Total Biplanes  Autogiros                                                                          | 141<br>159<br>28<br>364<br>26<br>6<br>6<br>3<br>399<br>52<br>2             |           |
| One Place                                                                                                                                                                                                                         | 141<br>159<br>28<br>364<br>26<br>26<br>6<br>3<br>399<br>52<br>2<br>637     |           |
| One Place Two Place Three Place Four and Five Place  Cabin (Landplane) Four to Seven Place  Total Cabin  Amphibions Seaplanes  Total Biplanes  Autogiros                                                                          | 141<br>159<br>28<br>364<br>26<br>26<br>6<br>3<br>399<br>52<br>2<br>637     |           |
| One Place. Two Place. Two Place. Four and Five Place.  Cabin (Landplane) Four to Seven Place.  Total Cabin.  Amphibions Seaplanes  Total Biplanes.  Autogiros  Helicopters  Military Airplane Deliveries.  Airplanes Exported (f) | 141<br>159<br>28<br>364<br>26<br>26<br>. 3<br>399<br>52<br>2<br>637<br>101 |           |
| One Place                                                                                                                                                                                                                         | 141<br>159<br>28<br>364<br>26<br>26<br>. 3<br>399<br>52<br>2<br>637<br>101 |           |

- (a) 2 Multi-engine planes. (b) 1 Multi-engine plane,
- (c) 15 Multi-engine planes
- (d) 39 Multi-engine planes.
- (e) 6 Multi-engine planes.
- (f) Does not include planes listed in the above breakdown nor planes exported in 1931 which were manufactured prior to January 1, 1931.

#### Miscellaneous Operations Summarized

A TOTAL of 811,590 persons flew as passengers in aircraft of miscellaneous flying operators in the United States during the first six months of 1931, according to the Aeronautics Branch of the Departure of Commerce. Scheduled air transport services during that period carried 193,651 passengers, making the total number of air passengers for the six months' period 1,005,241.

The number of passengers carried by miscellaneous operators in the first six months of this year represents a decrease from the total for the corresponding period of 1930, when 924,800 persons made flights as passengers with these operators.

Miscellaneous operations include such commercial activities as charter and sightseeing flights, crop dusting and aerial photography, and also student instruction, experimental flying and pleasure flying.

#### Racon Reduces Prices

RACON ELECTRIC CO., INC., pioneer manufacturers of units—horns and sound equipment, announces radical improvements in their units, giving much more powerful and perfect response as well as increasing efficiency, and attaining a faithful reproduction of the human voice. They also announce a reduction in prices on their complete line.

#### NORTHEAST

THE COLONIAL Division of American Airways, flying between New York and Boston, New York and Montreal, and New York and Cleveland via Albany and Buffalo, flew 98,547 miles in scheduled transport service during October, 1931, and carried 21,763 pounds of mail and 1,796 passengers.

HEADED by Deane Cunningham, Deane's Flying Service has recently been formed at Auburn to engage in student instruction and other forms of flying. The organization has a Curtiss Robin and is operating at Greenlaw Airport, two miles west of Auburn.

PLANS have been made for the construction of a large hangar at the Darling-Dingley Airport in Auburn.

'INSTALLATION of aviation fuel tanks on the municipal portion of the Augusta Airport has recently been started.

THE CONSTITUTIONALITY of Rhode Island's air law has come before the State's Supreme Court for a decision. The statute holds owners of aircraft absolutely liable for injuries to persons or property.

On Aug. 3, 1930, an airplane owned by the Buttonwoods Flying Service crashed in a tomato patch owned by Lemy Palin of Central Falls. The pilot landed safely by a parachute. Palin brought suit and was awarded \$200 in Eleventh District Court.

An appeal was taken by Attorney William A. Gunning for the plaintiff. Mr. Gunning field a demurrer to the plaintiff's declaration attacking the constitutionality of the statute, contending it deprived the defendant of property without due process of law and denied the defendant the equal protection of law in violation of Article 14 of the United States Constitution.

When the case came before the Superior Court from the fact that a constitutional question was raised, it was ordered certified to the Supreme Court for determination.

IMPRESSIVE increases in Middle Western U. S. Air Mail, passenger and express traffic, and an almost perfect air transport operations record, mark Transamerican Airlines Corporation's final report on its famu-55-minute, downtown Detroit - downtown Cleveland amphibion service for the current year, between April 1st and Nov. 8th when the service was suspended for the winter and replaced by fast. 80-minute service.

Despite unfavorable business conditions, Transamerican airliners flew 9,075 passengers on this division, a 61.62% increase over their 1930 patronage figure of 5,615 and a huge gain over their 1929 passenger

total of approximately 2,800. They transported 6,529 pounds of U. S. air mail and 11,462 pounds of air express this year as compared with 1,980 pounds of air mail and 2,876 pounds of air express in 1930. The 1929 air mail and express poundages were considerably lower than those of 1930.

FROM May 23rd, 1931, when passenger hopping was inaugurated at Floyd Bennett Field, to October 31st, 1931, a period of approximately five months, over 18,000 passengers were carried.

Officials at Floyd Bennett Field attribute this remarkable figure to the fact that they are able to offer the visitor to Floyd Bennett Field every facility for an airplane ride. A passenger has the choice of flying with either Clarence Chamberland or Roger Q. Williams, both famous transatlantic fliers, or of taking a trip in a trimotored Ford, a double-motored Kingbird, or one of the many types of single-motored open cockpit or cabin planes which operate from Floyd Bennett Field.

THE RECENTLY opened hunting season in Pennsylvania witnessed the first use of autogiros by game conservation departments of Montgomery and Buck Counties for the protection of wild life from illegal hunting methods. In many cases the game protectors were able to hover over hunterswhose methods or equipment seemed questionable, and where occasion demanded, they were enabled to effect landings in small clearings for closer investigation.

In this way, said the game protector, their range of usefulness was extended many times. The ability of autogiro aircraft to fly low and slow as well as at high speed has brought the type under consideration by state and municipal authorities for such work as forest fire patrol and bandit chasing

THE first private pilot's license for autogiros under a new ruling of the De partment of Commerce have been granted to Edward E. Law and Nathan Pitcairn, a nephew of Harold Pitcairn, president of the Autogiro Company of America.

Nathan Pitcairn, who soloed after a very



The Curtiss-Wright Junior amphibion, flown by Walter Beech at the Chicago Air meet for the unemployed

brief period of instruction, has never flown in any other aircraft but an autogiro.

W. LAURENCE LE PAGE, formerly chief engineer of the Kellett Aircraft Corporation, Philadelphia, Pa., has been made vice-president in charge of engineering.

Mr. Le Page has been associated with the Kellett corporation since the formation of the company. He has been in active charge of engineering for the past year during the design and development of the Model K-2 autopiro.

ZENO W. WICKS, former Lieut-Commander U. S. Navy, and erection superintendent at the Goodyear-Zeppelin airdock during the construction of the U. S. S. Akron, has been made assistant chief engineer of the Goodyear-Zeppelin Corporation.

W. H. Collins, who was superintendent of the Goodyear-Zeppelin plant during the construction of the Akron, has been placed in charge of production and ship erection.

THE first size in a full series of all-metal trumpet horns has just been offered the sound projection trade by the Fox Engineering Company, Toledo, manufacturers of horns and high-powered electro-dynamic

Notwithstanding the fact that these horns are six feet long, and have a bell diameter of thirty-two inches, they are of spun aluminum and free from lateral joints and seams. This construction makes possible a definite radial uniformity producing a fine tone. These horns are free from the influence of atmospheric and moisture conditions and are almost indestructible in normal use. Weight is twelve pounds.

#### SOUTHEAST

SO MANY airplanes were entered for the Second Baltimore Aircraft Show and Industrial Exposition, at Baltimore, Md., scheduled for the week November 15th to 22nd inclusive, that it was necessary to set up a tent 100 by 150 feet in addition to the langar equipment at the Service Field Airport, Park Heights avenue near Old Court Road, scene of the show, to house the exhibits.

Air circuses, indoor aircraft exhibitions, aircraft displays, glider demonstrations and model aircraft contests were features of the show.

ELEVEN aviatrices braved high winds in staging Baltimore's Second All-Women Air Carnival at the Curtiss-Wright Airport, Greenspring and Smith avenues, Baltimore, Md. The event was attended by more than 4,000 persons.

The free-for-all race over a seven-mile

triangular course was won by Miss Frances Harrell, of Valley Stream, N. Y., one of the two women members of the Caterpillar Club.

A precision contest was won by Miss Jassamine Goddard, of New York City. First place in the acrobatic contest was

First place in the acrobatic contest was won by Miss Helen Richey, of Pittsburgh.

AN ALTERNATE site for the municipal airport of Baltimore, Md., has been selected by Dr. Hugh H. Young, chairman of the Maryland Aviation Commission, which he has urged Mayor Howard A. Jackson to consider in place of the present airport site, which Dr. Young demands be abandoned as a "huge mistake." The site selected by Dr. Young is a tract of land approximately 600 acres, on the Annapolis Boulevard, about six miles from the center of the city of Baltimore, Dr. Young has secured options on the property, in toto, for \$490,000, or an average of \$840 per acre on the 584 acres. Retention of the present municipal airport site for the city of Baltimore, Md., as the best, though the most expensive of all those available, is recommended by W. Waters Pagon and Bancroft Hill, engineers, who several weeks ago were appointed by Mayor Howard A. Jackson to make a survey of the situation

According to the engineers' estimates, three more years will be needed to complete the airport, and an expenditure of an additional \$1,400,000. To date the city has spent approximately \$3,000.000.

A NEW airport known as Payge Field has been opened on the Philadelphia Road, three and a half miles outside of Baltimore, Md., under the management of S. J. Tillinghast, well-known filer in this section. According to Mr. Tillinghast, two existing runways of 1,500 feet are to be enlarged to 1,500 feet and 2,500 feet and other necessary additions are to be made.

STEPS are being taken to form a flying school at Annapolis, Md. It is expected that officers connected with the Aeronautic Department at the United States Naval Academy will furnish free instruction. At first only ground work will be given. Later as this phase of flying has been mastered, it is planned to buy an airplane for flight work. Captain S. Martin, secretary of the Annapolis Chamber of Commerce, is one of the backers in the movement.

THE DEDICATION of New Bern's airport was held on November 21, 22 and 23, during which time the Airport Association was host to a number of prominent pilots and aviation dignitaries.

A varied program of races, bomb-dropping, dead-stick landings, parachute contests and other exhibitions was arranged by Russ Brinkley, Managing Director.

#### NORTH CENTRAL

ARTICLES of incorporation have been filed by the Loveland Airplane Co., Milwaukee, with a capitalization of \$25,000. Incorporators are Allen D. Loveland, Margaret Loveland and John Wieber.

THE FLUOROSCOPE has been placed into service at the Curtiss-Wright airport just north of Milwaukee by Paul Trier, manager, for the purpose of locating hidden defects in the ship's body. The machine is on rollers and can be wheeled alongside the ship. A fluoroscopic screen is held by one of the employes and as the examination is unfolded the whole "insides" are thrown on the screen. This saves the substantial expense of taking an X-ray photograph of each part of the plane. When a break is located by the fluoroscope, an X-ray is taken for permanent record and the work of eliminating the trouble proceeds.

TEN acres of land directly adjacent to salzer field, La Crosse's municipal airport, have been leased by the common council. Grading of the airport has been ordered and after this is completed the council may order the construction of three paved runways 500 feet wide and 1,500 feet long. Because of a protest by the Northwest Airways, Inc., concerning the condition of the field last April, air mail planes have been landing at a temporary airport on French Island.

CENTURY AIR LINES, Inc., a division of the Cord Corporation, carried 6,110 passengers on its middle west division during the month of October.

This brings the total number of revenue passengers carried since March 23, 1931, to 46,323 it is reported. Century Air Lines has maintained a monthly average of more than 6,000 passengers since it began operations

THE Airlines Ticket Office of Detroit, specialized agency for the dispensing of air travel information and reservations for organized American air transport, was formally opened Monday, November 9, at the main entrance to the Book Building in the Motor City's downtown section. Centrally located and designed particularly for the air traveler, it has been incorporated and is being operated by Transamerican Airlines Corporation, Detroit's sole U. S. Air Mail carrier.

TRANSAMERICAN AIRLINES COR-PORATION inaugurated its first overland air passenger line between Detroit and Cleveland via Toledo, Monday, Nov. 9, on an 80minute flight schedule representing the fastest air travel ever offered between those three cities. The new service supplements TAC's non-passenger-carrying night Air Mail line linking these cities since April, 1929, and replaces its direct 55-Minute, Detroit-Cl-veland amphibian service suspended Nov. 8 for the winter.

TRANSAMERICAN AIRLINES COR-PORATION has moved (Nov. 16) its western U. S. Air Mail, Passenger and Express operations terminus at Chicago (III.) Municipal airport from American Airways' hangar to its new \$75,000 Chicago sales and service base following the latter's completion early in November. It is located near the city of Chicago's new Airport Administration building.

Built of brick and steel, with spaces for offices, stock rooms, service shop and boiler room, it will accommodate the single and multi-motored transport planes with which TAC links Detroit, Cleveland, and 15 other Middle Western cities. In addition, it will assure the holding company, Thompson Aeronautical Corporation, which operates the ground organization, ample facilities for projecting its sales and service program in the Chicago area.

WILLIAM F. PABST has been elected vice-president of the Kohler Aviation Corporation. He will be in charge of all operations in the western terminal, Milwaukee. Mr. Pabst was secretary of the Hamilton Metalplane Company until that firm was merged with the Boeing Airplane Company, a division of the United Aircraft and Transport Corporation.

The Kohler Aviation Corporation operates an amphibion service between Milwaukee and Detroit, flying three trips daily in each direction

EX-CELL-O Aircraft & Tool Corporation announces the appointment of Burton, Griffiths & Co., Ltd., Spatkbrook, Birmingham, England, as its exclusive representative in England. By this appointment, the London company will handle Ex-Cell-O's drill jig bushings, internal grinding spindles and precision diamond boring machines.

THE Nicholas-Beazley Airplane Company, Inc., Marshall, Missouri, has entered into a contract with Ole Fahlin, designer of the Fahlin propellers, who was formerly located at Sioux City, Iowa.

Mr. Fahlin is preparing to move all of his equipment and machinery for the manufacture of Fahlin propellers to the plant of the Nicholas-Beazley company, which will act as exclusive sales agents for his product.

#### SOUTH CENTRAL

A GROUP of students at the University of Missouri are organizing a flying club which they hope to affiliate with the Inter-collegiate Flying Clubs. Membership will be limited to twenty-five, with admission fee \$25.

UNITED STATES Airways will shortly transfer their operating base and equipment from Fairfax Airport to the Kansas City Municipal Airport, taking over Municipal Hangar No. 3 which will be vacated when T. and W. A. move into their new headquarters.

SKYWAY, INC., is now operating a passenger service between Kansas City and Wichita, offering Wichitans better connections with N. A. T. and Rapid Air Transport. One flight daily each way is offered, with Topeka an intermediate stop.

THE new air mail post office now being constructed at the Kansas City Airport is rapidly nearing completion, and will be ready for occupancy about November 15th. It will be a two-story structure of buff colored brick to harmonize with other buildings at the Municipal Airport, and is directly in line with the passenger station. The government weather bureau will use the second floor. The large volume of air mail handled daily by the Kansas City Airport created a demand for the new post office building, one of the few of its kind in the United States.

HOUSTON AIRPORT, Houston, Texas, was rededicated Saturday, October 31, in celebration of four years of progress at the airport, culminating this fall with the completion of \$25,000 worth of runways by the city. More than 100 fliers of the Southwest, flying all types of planes, and including the Third Attack Group from Galveston and the Kelly Field pursuit squadron from San Antonio, attended the celebration.

More than \$200,000 has been spent in improvements at the field since its establishment in 1927. These improvements include five hangars capable of housing about 60 planes; a complete lighting system; a full-time weather reporting station; the enlargement of National Guard quarters to include a machine shop and photograph laboratory; a radio building, and extension of administration building, and the recently completed system of runways.

THE formal opening of the new administration building at Brownsville, Pan-American airport, was celebrated Friday, October 23, with a luncheon for civil and military officials of South Texas and Northern Mexico.

IN order that all the forty-one pilots in the southern division of American Airways may be more familiar with the emergency fields established by the Department of Commerce along the air mail routes, orders have been issued for pilots to inspect the fields by actually landing in them, according to notice received by the Dallas representative from C. R. Smith, vice president of American Airways. The visits will not be made on regular runs, but during a two-day layoff granted each fiper and in a special plane.

AN emergency landing field has been leased near Clarendon, Texas, by American Airways, Inc. Work on the 70-acre field is going forward and will be soon completed.

PROSPECTS that additional fees for the use of Love Field, Dallas municipal airport, may be charged by the city to obtain sufficient revenue for field to be self-supporting are in view, it is reported.

For the last two years, a 1-cent-per-gallon fee on gasoline sold or used at port has been the only source of revenue. This fee provides about \$8,500 a year, whereas the expenses of operating and maintaining the airport amount to \$11,800 a year.

DAILY airplane passenger line will be routed from Houston to San Antonio within the next ten days by Bowen Air Lines, according to Leonard G. Simon, general traffic manager. The new line will put the two cities one hour and fifteen minutes apart.

Tentative plans provide for a plane to depart from Houston at 12:15 p.m. and arrive in San Antonio at 1:30 p.m. The return plane will depart from San Antonio at 12:15 p.m. and land at Houston at 1:15 p.m., it was reported.

PRESENTATION of the Noel Davis trophy for efficiency was made to the St. Louis Naval Reserve Aviation Division at Lambert-St. Louis Field on Nov. 5.

The trophy, a bronze plaque, is awarded annually to the unit showing the greatest efficiency. The St. Louis division won the prize in competition with 45 other units throughout the country. The local division is commanded by Lieut. Fred Fisher, Reserve, and the St. Louis aviation base is in charge of Lieut. Frank Weld of the regular navy.

MRS. RUTH STEWART of St. Louis and Mrs. Debie Stanford, of Indianapolis and Toronto, plan to leave Toronto shortly on a flight to Buenos Aires, Argentina.

The route covers about 5,500 miles, of which 1,500 miles is over portions of the Atlantic and Pacific Oceans and the Caribbean Sea. Refueling points will be at Miami, Fla., the Panama Canal Zone, and Santiago, Chile. A Lockheed-Vega plane will be used. Both Mrs. Stewart and Mrs. Stanford are transport pilots and veterans of the national air races.

A NEW passenger service was started Nov. 1 between St. Louis and San Antonio, Tex., by Braniff Airways and Bowen Airlines. The transfer point in the service is at Tulsa, Okla. The elapsed time between the two terminals is seven hours.

VON HOFFMAN Air College reports the largest enrollment of students in the history of the school. Students have arrived at the school at an average of two each day for the past three months.

Many new subjects are now being taught

at the college, such as slop mathematics, advanced instruction on instruments, meteorology, radio and parachutes. These additional subjects have increased the duration of the various courses. The complete airplane and engine mechanic's course and the limited commercial pilot's course will be five months; the master mechanic's course and the transport course will be eight months.

TOTAL Century Airline traffic through St. Louis during October reached 603 passengers. Over the middle west division 6,110 passengers were carried, bringing the total since the line began operations last March 23 to 46,323 passengers.

RALPH RUGH, staff photographer for American Airways, recently completed a tour of the entire western and southern systems of the airline, making a complete series of photographs of the various bases and general activities.

NIGHT flying lights and landing flares will be installed on six passenger planes belonging to Braniff Airways, Inc., within the next two weeks to comply with Department of Commerce regulations for planes used in night flying.

Equipment includes two powerful searchlights set in the leading edge of the wings as well as flares which can be released in the air over emergency landing fields. Flares are strong enough to light up an entire landing field and operate on a release mechanism similar to that used for dropping bombs in army planes.

Although no night schedules are being planned at this time by the Braniff line, Shrader said the lights were needed during the winter months due to the early fall of dusk.

DEDICATION of the Chicago-St. Louis and New Orleans air mail and passenger route of Universal Division, American Airways, Inc., in honor of Sieur de La Salle, discoverer of the Ohio River and explorer of the Mississippl Valley, was held on Sunday, Nov. 8. The name of the line will be "The La Salle Route."

LANDON Air Lines of Kansas City will inaugurate a four-plane-daily air service between Curtiss-Steinberg Airport near St. Louis and Kansas City.

The Kansas City schedule, including four west-bound and four east-bound planes per day, will be flown with new ten-passenger trimotored Stinson planes, originally purchased for a Kansas City-Memphis schedule, which the company had planned. The Memphis schedule was abandoned because of the price of airplane fuel in the Temessee city, Landon's company announced.

#### NORTHWEST

WENATCHEE, WASH., airport has installed a revolving beacon light visible fifty miles away, a group of flood lights, and boundary lights along the edges. Cental Washington Airways made a number of improvements, and impetus to the program of lighting was given as a reception to the trans-Pacific flyers, Herndon and Pangborn, for the new lighting system was hurried along as a special welcome to the Washington men acclaimed by the nation after landing in the Northwest.

WITH commissions in the naval flying reserve as a goal, free aviation courses are being offered at the University of Washington, Seattle, where fine equipment for these courses has been installed. The aviation course, valued at \$6,000, is given gratis to all seniors and graduates who are able to pass the physical exam given by the department of naval science there. Included in the course is six months ground work with occasional flights, followed by a period of six weeks training at Sand Point Naval Air Station, and an eight months flying course at the naval air station at Pensacola, Florida.

RESUME of six months of flights as accomplished by the ships and personnel of the Mamer Air Transport Co., Spokane, is most interesting. For this half-year period, ending October first, Mamer carried 3,030 passengers on its Spokane-Wenatchee-Seattle-Tacoma air way, its planes traveling 99,970 miles, with an average number of ten passengers on its flights, planes being 12 passenger Fords. More than a hundred chartered flights were made by Mamer to different parts of the United States, Mexico and Canada. At the company's school more than 1,000 students were taught to fly. The company also aided in forest fire work.

WALLA WALLA, WASH., will improve its airport with a new \$5,500 hangar of fireproof construction. The city commission has decided on a hangar  $80 \times 60$  feet, and of height sufficient to store large trimotored planes, which will house offices and rest rooms. It will be of concrete.

THE CITY has received \$23,000 from the state in payment for an issue of bonds which it voted to purchase the city airport from the Kelso Airport Company. About 60 acres of ground will be acquired by the city in taking over the airport which is to be improved. A fine lighting system has recently been installed by the Federal Government.

FOR the first time since his death, the memory of Silas Christofferson, Oregon's great pioneer aviator, was preserved in a tangible manner with the dedication recently of the airport on the Columbia River high-

way, just east of the city limits, as "Christ-offerson airport"

The simple ceremony of dedication, with Mrs. Edna E. Christofferson, widow of the pioneer, speaking words that will perpetuate his name here, was staged in the shadows of Mount Adams and Mount St. Helens, underneath which he made his first flights here in 1908. She piloted a plane alone over the field, dropping flowers on it at the close of the ceremonies.

OREGON ranks 21st among the states of the union in the number of licensed airplane pilots and 20th in the number of airplanes, according to the study just completed by the aeronautics branch of the Unted States Department of Commerce and released vesterday.

There were 205 licensed pilots in Oregon October 1, 1931, and 148 airplanes, licensed and unlicensed.

Of the 148 airplanes, 79 were licensed by the Department of Commerce and 69 were unlicensed. Fourteen gliders were regis-

APPOINTMENT of Rasmussen-Meadows, Inc., at Swan Island airport as dealers in Oregon for the new model Fairchild 22 monoplane, was announced last week. The company plans early purchase of one of the planes for demonstration here.

The name Rasmussen-Meadows, Inc., of the Portland air firm replaces the Rasmussen Air Service, by which it has been known heretofore. Officers of the company, just re-elected, are Lea Meadows, president, and Malcolm Rasmussen, secretary.

IN November the Boeing Airplane Company reached the peak employment for the year when its payroll passed the 1,000 mark, giving the plant more employees than at any other time during 1931. A total of 12,500 square feet of floor space is now being added to the plant to provide ample room for the construction of five large low-wing, all-metal monoplane bombers being roduced for the Army Air Corps.

#### SOUTHWEST

AIRPLANES will play a big part in the revival of Atlanta, "ghost" city of the Idaho wilderness and mining town of the boom days. With the first snowfall Atlanta is cut off from the rest of the world, and the 175 men there now with the reopening of the Boise-Rochester mining properties, will depend upon airplanes bringing them news from the outside world.

A landing field in this "ghost city" has been constructed and the Boise Airplane Company will make trips to Atlanta and return twice a week, carrying mail and passengers. IRVING F. LOWRY, formerly assistant manager of the Municipal Airport at Denver, has been appointed manager. The second hangar is now completed and is occupied by Western Air Express. A program of field improvement is under way under which the field has been sown to a special grass which will make its mile square area an inviting spot to land. A new dope building is being completed for the use of all companies operating on the field.

THE Colorado-Utah Scenic Airways Company filed a petition with the public utilities commission of Denver recently, asking permission to operate a passenger and express line between Denver and Grand Junction.

L. H. SIMSON has taken over the office of assistant airways traffic supervisor for the U. S. Department of Commerce at Salt Lake City, succeeding Art Johnson, who has been transferred to a similar position at a new division created at Oakland, California. Mr. Johnson has been in Salt Lake City eleven years. Mr. Simson has been employed at many air stations throughout the west and came here from Los Angeles.

KELVIN H. PACK, of Salt Lake City, who recently was graduated from an aeronautical school in Oakland, California, has left for Butte, Montana, to accept a position with the National Parks Airways.

FIVE fliers, headed by J. K. Von Althaus of San Jose, were scheduled to sail from San Francisco Nov. 7 for Honolulu where they will attempt a flight from Hawaii to the mainland.

A Stimson-Detroiter, equipped for a 31hour flight, will be used. The pilot is to be named following test flights in Hawaii.

ART BAHER has been promoted to district traffic agent for Century Pacific Lines, Ltd., at Oakland. James S. Robb, formerly with the Ludington Lines at Washington, D. C., has taken Baher's former traffic post at the San Francisco Bay Airdrome, Alameda.

ONE HOUR and fifty-eight minute service between Los Angeles and San Francisco was inaugurated October 15 by Varney Air Service, Ltd. At the same time the Sacramento-San Francisco flying time was cut from forty-five to twenty-two minutes.

Three Lockheed-Orions were used at the start of the service. Following a week of capacity business on the lines, Walter T. Varney, founder of the company, placed an order with the Lockheed plant for three more planes.

When these planes are delivered the Los Angeles schedule is to be increased from two round trips daily to flights every two hours, according to present plans.

The service, operated under the name of Varney Speed Lanes, is advertised as an extra-fare de luxe service, refunds being made on a 10 cents per minute basis if the plane fails to make schedule.

THE International Flying Service of Phoenix, Ariz., has been appointed Flyabout and Eaglerock distributor exclusively for Arizona by the Alexander Aircraft Company of Colorado Springs. Charles Goldtrap, vice-president of the International company, took flyaway delivery on a Szekely motored Flyabout November 11.

MR. FRED KOLOUCH, JR., of Schuyler, Nebraska, has been appointed a Flyabout lealer by the Alexander Aircraft Company of Colorado Springs. Mr. Kolouch took flyaway delivery of his first Szekely motored Flyabout in November.

THE NINTH quarterly enrollment at the Boeing School of Aeronautics, located at the Coakland Municipal Airport, began on Monday, October 6. The Boeing School reports that this is the largest enrollment of the current year and is seven-eighth capacity for a Freshman class. Students enrolled in the master mechanic and master pilot courses have come from 22 states and two territories in the Union, and they have arrived by automobile, bus, train, boat and airplane, calling into use all modern methods of transportation.

#### CONTACTS

By Frank E. Samuels

LESLIE H. BOWMAN, factory sales representative for "Waco," on the West Coast, reports that the Varney company of San Francisco, has taken over the distribution of Wacos for Northern California. They have just purchased two late model planes for demonstrators, a Waco D. F. 2 and a Waco F.

Bowman also reports that the Lee Eyerly Aviation Corporation of Salem, Oregon, has just been appointed distributors of Waco for Oregon and Western Idaho.

The Marion McKeene Aeronautics, Ltd, Los Angeles Municipal Airport, has the honor of selling the first Waco F. 2 to be delivered on the West Coast. The purchaser of this beautiful plane was Frank Borzage, famous Fox Film director. Marion Mc-Keene also had the pleasure of having taught both Mr. and Mrs. Borzage to fly. They both took primary and advanced courses under the tuition of the McKeene School. The plane, which is dolled up fit for a deluxe show exhibit, and fully equipped with blind flying instruments and landing lights, was ferried from the factory to the coast by McKeene.

WHILE on the subject of the Dycer Airport we should mention Charlie Babb who is running a used plane sales office at the port. He has been unusually successful in this venture. Within the past six weeks he has delivered thirteen planes and has cash deposits on two other ships. During this period he sold two parachutes, two motors and a number of motor parts. He has an assortment of some high grade used planes on hand and is well satisfied with the business being done.

THE Courier Monoplane Co., Ltd., formerly at Municipal Airport, Long Beach, Calif., has taken a lease on the buildings and flying field of the old Dycer Airport on Western Avenue, where they will continue building the Courier plane. It is the intention of the new management to erect new buildings, including a factory, shop and hangars. In addition to new building, they will make a bid for student instruction and secure new equipment for taxi service and cross-country flights.

AN AGREEMENT whereby the Western Air Express will lease approximately 7,000 square feet of space in the new hangar at the municipal airport for \$3,500 a year, was reached during the month at a conference between officials of the aviation company and Walter B. Lowry, manager of parks and improvements of Denver.

The weather reporting system to serve mail and passenger planes flying the airways in and out of Pueblo will be completely installed within the next few weeks, according to Joseph George, chief meteorologist for Western Air Express. Mr. George has just completed a survey of airways from Cheyenne, Wyo, to El Paso, Texas, and from Pueblo to Amarillo, Texas, Pueblo will be one of the key cities in the new weather report system. The observatory of that city will be linked with other government bureaus by a complete teletype system.

DENVER has abandoned its plans to oil the 100 acres making up the landing field at the municipal airport. Instead the field will be planted with grass. In fact, work on this project has already started and a crew of more than 30 men are engaged in the work. Fifteen thousand pounds of a specially prepared mixture of grass seed adapted for airport use was purchased by the city, and now is being planted at the rate of 150 pounds to the acre. The ground is being harrowed and rolled as fast as the seed is planted.

ANNOUNCEMENT of the appointment of Irvin F. Lowry as manager of the municipal airport here was made shortly after Nov. 1. Lowry, who has for several months been assistant manager of the field, succeeds William F. Wunderlich, who has held this office for over two years. The salary of the airport head will be cut from \$275 to \$250 per month and the position of assistant manager will be abolished.

#### NEW AERONAUTICAL BOOKS

#### BEGINNER'S BOOK OF MODEL AIRPLANES

By CARL H. CLAUDY

I N this book, the author keeps well in mind the fact that he is writing for beginners and uses almost half of his space getting ready to explain the business of model making. Other explanatory material reduces the space for the actual description of models to a comparatively few pages, giving the writer time to describe only four models.

However, for one altogether unacquainted with airplanes, the book is probably well-proportioned and is so carefully thought out that the beginner can feel quite conversant concerning the business of flight when the has digested its pages. The style is simple and straightfoward, and manages to attain the unusual in a book of this sort—a chatty, conversant air that gives a wide berth to the "manual" type of exposition.

The Beginner's Book of Model Airplanes allots considerable space to the principles of aerodynamics, a chapter to tools and materials, and gives the model builder after he has finished his models two chapters on having fun with them.

### MODEL AIRPLANES By JOSEPH S. OTT

M ODEL AIRPLANES, BUILDING AND FLYING, by Joseph S. Ott, model builder of twenty years' experience, is a book designed for both beginners and experienced model builders, inasmuch as it begins with fundamentals and proceeds gradually to a discussion of the most intricate phases of model building. The author has attempted to make his book "a complete compilation of the progress of airplane construction, translated in terms of model building."

The first chapters of the book deal with the tools, materials and technique and include some aerodynamical theory. The latter chapters are devoted to descriptions, illustrations, plans, designs and detailed explanations of methods. Twenty-five compete flying models are described. The intended use of this book as a handbook for the model builder is indicated by the competer and detailed index which is included.

#### 1931 AVIATION REPORTS

FHE 1931 United States Aviation Reports," the fourth annual volume in a series designed to cover completely the subject of aeronautical law, contains much valuable information on the legal status of aeronautics. According to the editors, the year 1931 saw the appearance of more authoritative pronouncements by courts on critical points of aviation law than any other year to date. These are published in this book in the form of judges' charges to juries, available only in this work.

The volume includes all state and Federal

statutes passed up to September 1, 1931, and also a cumulative table of cases from the first case in 1822 to the present. Other new material consists of glider regulations and Air Commerce Regulations governing entry and clearance of aircraft. The volume is edited by Arnold W. Knauth, Henry G. Hotchkiss, and Emory H. Niles.

### I AM STILL ALIVE

661 AM STILL ALIVE" is a book of thrills.

Its chapter headings tell the story of this book by the world's most famous crash pilot: When Seconds Count, Saved by a Wire, Straight Through a Wall, I Break My Neck, A Life in the Balance. It is the story of his career as a purveyor of thrills by way of the newest thrill medium—the airplane. Dick Grace, "the crack-up engineer," has made thirty-four intentional crashes. "I Am Still Alive" recounts the sensations in them.

The book is hardly one to court favor with the sober aviation industry, though Grace takes time near the end of his book to justify his profession. But it is certainly one that will claim the interest of any reader who chances to leaf its pages; each sentence in the whole volume is one to grip the roving eye. If it is crash thrills you want, don't waste time with the old barnstormer's yarn of an occasional crack-up. Dick Grace has had them all and he tells about them—and tells them well—in "I Am Still Alive."

#### ORGANIZATION PUBLICATIONS

THE feature article of the Curtiss-Wright-Review for October is devoted to the Do.X and its twelve Curtiss Conqueror engines, with some account of the overhauling of the engines after their three-continent tour. The advantages of viewing Manhattan from the Air Ferries are pointed out in another story. Descriptions of new Curtiss-Wright models and general organization news constitute the balance of the magazine.

THE National Exchange Club recently published a detailed report of its activities in the aviation field. The figures given cover the number of airports and emergency landing fields established through the Club's efforts, the number of such fields now being planned for, airway markers established, aviation events conducted, etc. The local organizations responsible for each development are listed. The survey is reprinted from the Exchange Club's magazine, the Exchangite.

THE Trans-Canada Air Pageant participated in by the Toronto Flying Club, Ltd., is described in Contact, the club publication. Another aviation sporting event in which members of the club took part was an air derby from Toronto to Windsor and return, a distance of 449 miles. Items concerning still other activities impress the reader with the energy and enterprise of this flying club.

McMullen Air Comments, published monthly by the McMullen Airways Corporation, contains in its November issue news items concerning aviation in Florida and notes on personnel and students. A description of the opening of operations at Gainesville, Florida, by the McMullen Company is the leading story of the issue. Announcement of aerial photography service by the company is also included.

THE Sperryscope, published by the Sperry Gyroscope Company, presents in its issue for September an article on the clipper ship Lightning, treating of the difficultes of steering a heavy salling vessel when speed was an object and bringing out in forcible contrast the safety and comfort which the gyro-compass brings to the modern helmsman. The lighting system at Floyd Bennett Airport, New York City, is described in another article. News and pictures of various company enterprises and personalities are included in this issue.

THE development of the Buhl autogiro is discussed in Autogiro News for October, as is the use of the autogiro in police work. The great public interest in the craft is reflected in the supplement to the October issue which tabulates the amount of newspaper publicity which various models have received all over the country.

Engineering Experiment Station News, published at Ohio State University, includes papers on a wide range of subjects, mainly reports of investigation and research work done by members of the station staff. Among the titles are "Study of Electromagnetic Field about a Vertical Antenna," "Radio Transmission Survey," "Piling Investigation."

THE October issue of News Wing, organ of Eastern Air Transport, Inc., carries a story on the Curtiss Condors now in use on the southern division of that line, with a description of their ceremonies on the occasion of their first trip south of Richmond. News items concerning passengers on the line and the personnel of the company occupy the rest of the paper.

THE Wasp- and Hornet-powered planes which took part in the National Air Races at Cleveland this year are featured in two articles in the October issue of the Bee-Hive, Pratt & Whitney Aircraft Company publication

DECEMBER, 1931



## NOW-

## "SERVING AVIATION IN THE WEST"

IN OUR NEW HOME AT UNITED AIRPORT, BURBANK, CAL.

WITH AUTHORIZED PARTS AND SERVICE ON

# WARNER ENGINES PRATT and WHITNEY ENGINES WRIGHT "WHIRLWIND" ENGINES HAMILTON STANDARD PROPELLERS

To our already complete facilities for servicing WRIGHT "WHIRLWIND" and KINNER engines, we have added approved equipment for reconditioning PRATT AND WHITNEY

and WARNER engines in strict accordance with factory specifications. Propeller equipment has been installed to render every service in connection with steel propellers.

#### AUTHORIZED SALES REPRESENTATIVES

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Wright "Whirlwind" Engines
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Warner Engines
Scintilla Aircraft Magnetos

Stromberg Aircraft Carburetors Flightex Fabric Bendix Wheels and Brakes Eclipse Starters and Generators Aerol Struts
Berry Brothers Aircraft Finishes
Elgin "Avigo" Instruments
Hamilton Standard Propellers
Packard Ignition Cable

#### APPROVED SERVICE STATIONS

NORTHWEST AIR SERVICE, SEATTLE, WASHINGTON SANTA MARIA AIR LINES, SANTA MARIA, CALIFORNIA SAN DIEGO AIR SERVICE, SAN DIEGO, CLIFORNIA

## PACIFIC AIRMOTIVE CORP., LTD.

UNITED AIRPORT, BURBANK, CALIF.

LOS ANGELES AIRPORT, INGLEWOOD, CALIF. OAKLAND AIRPORT, OAKLAND, CALIF.

## SERVING AVIATION in the WEST

#### Palmer Nicholls



Pacific Airmotive Corp. hangar at Los Angeles Airport, Inglewood, Calif.

HE history of Pacific Airmotive Corporation is the story of an unpretentious beginning, careful service, and steady expansion. Organized early in 1928 when commercial aviation began its swift development, the company has grown with the industry until it arrived at its present strategic position of "Serving Aviation in the West."

The company opened business with a small staff of six persons, in a building of not more than 5,000 square feet. The original lines consisted of Wright Whirlwind engines, Scintilla aircraft magnetos and Stromberg carburetors.

In 1929 the company made the first step toward the present extensive organization, so completely equipped that it could engage in manufacturing in many phases of its work. At that time the company was reorganized as a California corporation under the present name of Pacific Airmotive Corporation.

In August of 1930 the company spread itself again when it moved to the Los Angeles Municipal Airport, where it set up shop in a building more than five times as large as the original home. Several new lines were added, including Bendix wheels and brakes, Eclipse starters and generators, Elgin "Avigo" instruments, Berry Brothers aircraft products, Flightex fabric, Paragon propellers and



Shop at Oakland Municipal Airport, Oakland, California

other smaller accessory aircraft supplies. Sales and service representation for the Kinner Airplane & Motor Corporation were later added.

The repair department of the company was also enlarged and the company extended the territory it served, looking toward its present ambitious program of serving the whole West. A branch was established at the Oakland Municipal Airport and three approved service stations were appointed along the western coast.

These are: Santa Maria Airlines, Santa Maria, Calif.; San Diego Air Service, San Diego, Calif., and Northwest Air Service, Seattle, Wash. Personnel of the Company at this time had increased to 38 people exclusive of the personnel employed by the approved service stations. Annual business approximated \$250,000.

The next progressive step was made in October of 1931 when the company was appointed sales and service representatives for Pratt & Whitney and Warner engines and Hamilton-Standard propellers. The company moved again to new and larger quarters, this time to the United Airport Burbank, California, where it is now located. The Los Angeles hangar was retained to serve as a small branch where a limited stock of parts and storage facilities are available. In its new home, Pacific Airmotive has approximately 36,000 square feet devoted to the servicing of aircraft. The shop has been greatly enlarged and includes the finest factory approved equipment for servicing engines. Additional new equipment has been added for testing and reconditioning carburetors, magnetos, starters, generators, wheels and brakes.

An interesting point in connection with the new shop equipment is a complete cleaning plant located outside of the shop itself.

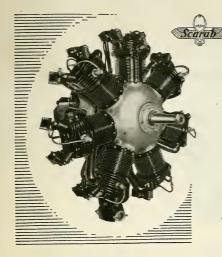
Other new equipment installed consists of a modern sandblasting plant, latest type automatically controlled baking ovens, special automatically controlled hot oil baths and



Engine shop assembly department at United Airport, Burbank



Electrical and carburetor equipment at United Airport



Owners of Warner-Scarab engines on the Pacific Coast may now secure direct factory—authorized service through the facilities of Pacific Airmotive Corporation

Thus prompt and reliable service is now added to that inherent reliability for which the name Warner-Scarab has become synonymous in the minds of flyers.

WARNER AIRCRAFT CORP.

DETROIT, MICHIGAN

a Wadell Universal master and connecting rod line reaming fixture. This fixture makes it possible to line ream all types of master and connecting rods with factory precision.

A complete propeller department has been established. Among the equipment is a sixty-ton self-contained hydraulic for straightening.

This department is so well-equipped with etching tanks and factory-designed grinding and polishing equipment that complete propellers can be manufactured.

A complete aircraft repair depot operating as an approved repair depot of the Aeronautical Branch of the Department of Commerce has been established. For this department the company has received an approval for every type of work issued by the Department.

The new location includes a store and stockroom carrying practically every requirement for the operation and maintenance of aircraft. More than six thousand individual items are regularly carried in stock; merchandise inventory at this time is approximately \$85,000. The

value of special equipment and special tools is approximately \$45,000.

Present directors of the company are: W. F. Thomas

Present directors of the company are: W. E. Thomas, President and General Manager; Palmer Nicholls, Vice-President in Charge of Sales; Ross Hadley, Charles R. Hadley Company; H. A. Burgess, Western Air Express; John M. Rogers, Douglas Company.



Pacific Airmotive Corp. inspection dept., United Airport



Department for repairing metal propellers at United Airport



Pacific Airmotive Corp. store at Oakland Municipal Airport

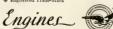
# times around the world



#### with PRATT & WHITNEY ENGINES

With every tick of the clock Pratt & Whitney engines are making new entries in their records of dependability. During every hour of every day private, military and commercial planes are completing flights which owe their speed and performance to superb power. On government regulated air transport routes alone, Wasps and Hornets average, at a conservative estimate, over 100,000 miles daily. Here is a never ending test of stamina—a continuous check upon the choice of Pratt & Whitney power plant equipment by America's major air transport lines.

## Wasp\* & Hornet



Pratt & Whitney dependability marks the Pacific Coast service on Wasp and Hornet engines furnished at new modern plant of PACIFIC AIR MOTIVE CORPORATION United Airport, Burbank, California



## PRATT & WHITNEY AIRCRAFT CO

EAST HARTFORD . . . . . CONNECTICUT, U. S. A.

Division of United Aircraft & Transport Corporation

Manufactured in Canada by Canadian Pratt & Whitney Aircraft Co., Ltd., Longueuil, P. Q.; in Continental Europe by Bavarian Motor Works, Munich; in Japan by Nakajima Aircraft Works, Tokyo.



DEPENDABILITY, uniform high quality and consistently excellent results have made Berryloid Aircraft Finishes first choice of the industry. . . . Pacific Airmotive—working in close cooperation with Berry Brothers—guarantees Berryloid performance in the West. . . . Let these authorities help you with your problems relating to the finishing or covering of aircraft. Get the benefit of the latest improvements. Write them for information and new combination color card and finishing specifications.

## BERRY BROTHERS

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# CONGRATULATIONS PACIFIC AIRMOTIVE!



Eigin Compass, type Co Spring suspension of the magnetic element. Re able, durable

At this time of your expansion into new quarters, Elgin extends congratulations for your past progress and service in the development of western aviation, and sincere good wishes for future growth and success.



Elgin Altımeter, type AA. 15,000 ft. Accurate, sensitive, lagless. Fixed main dial

Elgin Aircraft Instruments are distributed on the West Coast by the Pacific Airmotive Corporation.

These instruments are made with the same unerring precision—the same painstaking care that has won a world-wide reputation for Elgin watches.



Elgin Tachometer, type TG. Chronometric. Shock proof fly and fully jeweler

Headquarters for the Pacific Airmotive Corporation are: United Airport, Burbank, their new home; Los Angeles Airport, Inglewood; Oakland Airport, Oakland, California.



Elgin Clock, type Wo 8-day adjusted movemen

#### ELGIN NATIONAL WATCH CO.

Aircraft Instrument Division
ELGIN, ILLINOIS
New York Office: 20 West 47th Street

## SCINTILLA AIRCRAFT MAGNETOS

represented in the West

## PACIFIC AIRMOTIVE CORPORATION

Scintilla congratulates Pacific Airmotive upon its appointment as authorized representative of Pratt & Whitney engines—engines which depend upon Scintilla Aircraft Magnetos for reliable and efficient ignition.

Much of the credit for the high esteem in which Scintilla Aircraft Magnetos are held in the West is due to the expert service given them by Pacific Airmotive Corporation, authorized distributor.

An efficient engine, a reliable magneto, and careful service cannot fail to win the confidence of pilot and plane owner; and indicate a splendid success for Pacific Airmotive.

SCINTILLA MAGNETO CO., INC.

Contractors to the U.S. Army and Navy (Subsidiary of Bendix Aviation Corporation)



## LATIN AMERICAN AVIATION

#### Brazilian Army Planes Open New Mail Service

THE Brazilian army air service, which two months ago inaugurated air mail service between Rio de Janeiro and Sao Paulo, has now announced that it intends to extend the line into the interior of the country. The new line will terminate at Goyaz, capital of the state of Goyaz, with stops at Ribeirad Preto, center of the interior coffee district of the state of Sao Paulo, and at Uberaba, Uberlandia, Araguary, and Itamery.

Another line projected is that from Rio de Janeiro to Bello Horizonte and an extension is planned from Sao Paulo to Curityba, capital of the state of Parana.

The service from Sao Paulo to Goyaz will be a weekly one. The service already in operation is operated tri-weekly.

#### Cubans Get Free Rides

TO promote airmindedness the Curtiss company—Compañia Nacional Cubana de Aviación Curtiss—is offering each week, free of charge, an air trip to three residents of Cuba. Applications for the flights are received by letter and the winners are selected by lot each Saturday at the company's Havana office. More than 4,000 letters were received for the first drawing.

The Curtiss company operates a passenger, mail and express airline between Havana, Santa Clara, Cienfuegos, Marón, Camagüey, Las Tunas, Holguin and Santiago.

#### New Head for Uruguayan School

THE president of the Uruguayan Republic has been appointed a new director for the military aviation school. Colonel Tydeo Larre Borges is now in active charge.

#### Scadta Contemplates Extensions

A NEW air service connecting Venezuela and Columbia may be inaugurated by the "Scadta" company. The service would be between Maraicaibo and Buenaventura, via Cucuta, Gamarra, Puerto Berrio and Cali.

It has been reported that the company may put new planes into operation between Barranquilla and Bogota; seaplanes from Barranquilla to La Dorada and landplanes from La Dorada to Bogota, reducing the flying time of the entire trip to five hours. It is stated that the company contemplates a fifty per cent reduction in rates.

#### Argentina Makes Survey of Civil Aviation

THE Directors of Civil Aviation and the Bureau of Posts and Telegraphs have recently completed a commercial air survey of the northern provinces, with the result that it is expected that an airline between Buenos Aires and Asuncion, Paraguay, via the

province of Entre Rios and Corientes will be established.

The survey also included a study of government mail and passenger routes from Buenos Aires to the northwest. Although no further mail services will be established at the present time, it is hoped eventually to create a service tie up with the Bolivian air services now operating from the Argentine border through Cochabamba to La Paz.

#### Cuban Commissions Give Prize

THE Cuban National Tourist Commission has announced a prize for competition in the All American Air Races in Miami, Florida, January 7-9. The Commission is also contemplating bringing the Races, or a part of the attractions, to Havana. The Cuban Air Corps will be represented in the Miami air meeting.

#### Argentina Gets Air Equipment

SINCE October, 1930, more than sixty military airplanes have been built at the Argentine Government factory. These include thirty airplanes of the Avro Gosport type and thirty of the Avro Dewoitine type. Thirty Lorraine-Dietriech motors have also been constructed.

Government aviation purchases in the last few months included fifteen English Avro planes for military and training use, seven German Junkers planes and parts and material to build a quantity of American airplane engines.

#### Guatemala Orders Planes

DURING September the Guatemalan War Department placed an order in the United States for two three-passenger biplanes. Other government equipment already on hand was three Potez bombers, two Morane training planes, two American cabin monoplanes, and one American three-seater biplane.

#### C. A. T. Plans New Lines .

ANNOUNCEMENT has been made that if present plans of the Corporation Aeronautica de Transportes are successfully carried out, direct air service will soon be inaugurated between Torreon and San Antonio, carrying passengers, mail and express. In the event this new air line is established it is probable that the service between Torreon and Brownsville will be discontinued. The passenger and mail business over this line is said to be very light and not quite sufficient to defray operating expenses. The passenger traffic, if it can be made direct from Torreon and Monterrey to San Antonio, Texas, would be rather heavy.

Establishment of a line between Laredo and Monterey is also being considered, as well as a service from Laredo to Dallas and to San Antonio.

#### Central Airport Undergoes Improvements

CENTRAL AIRPORT in Mexico City was greatly improved during 1931. A lighting system of the port, which is the largest air field in Mexico, was installed, runways were constructed, and the field was leveled. A boulevard leading from the field to the Puebla highway was also built.

#### Mexico Finances Air Mail Service

FUNDS for the maintenance of the national and international air mail service have been made available through the Ministry of Finance authorizing the postal department to draw on an emergency appropriation. The requirements for 1932 will be taken care of from the national budget.

#### American Operates Dominican Airline

TRIWEEKLY service between the cities Santo Domingo and Santiago of the Dominican Republic is being operated by an American citizen. At present the service is limited to passengers, but negotiations are being conducted with the Government with a view to obtaining a mail contract. From May, when the service was established, through August, 275 passengers were carried.

The trip, which is about eighty miles, requires forty minutes. It is estimated that this plane, the only privately-owned plane in the Republic, flew about 5,000 miles during the first eight months of 1931.

Aside from occasional barnstormers, there is no other aeronautical activity in the Republic. The government planes were destroyed in the cyclone of September, 1930, and the national aviation school was subsequently discontinued.

#### Matamoros to Get New Airport

PLANS for the opening of a new airport at Matamoros are under way. A conference has been held between R. A. Obregon, of the department of communications and public works, and Roberto Garcia, mayor of Matamoros. A site located two miles south of the city, which is across the Rio Grande from Brownsville, Texas, is to be improved and facilities provided. The city will bear the expense of equipping and providing the airport.

#### Airport Under Construction at Villa Juarez

AN aviation field is being built at Villa Juarez by soldiers under the command of Lieut. Bonafacio Morales. Levelling of the ground has been completed and hangars are being erected. This will be a convenience to residents of Tampico and El Mante who desire to make quick trios.

#### Mexico Outlaws Low Flying

Mexico has been conducting a campaign against low flying and acrobatics over populated areas. Newspapers and periodicals have coöperated in publicizing the campaign.

## FOREIGN NEWS IN BRIEF

Compiled from reports from AERO DIGEST correspondents and the Aeronautics Trade Division, Bureau of Foreign and Domestic Commerce.

#### **GERMANY**

(EDWIN P. A. HEINZE)

THE congress of the International Sailflight Study Commission was opened on October 1 at London. Delegates from Great
Britain, France, Belgium, Holland, Italy
and Germany, as well as representatives of
the United States of America and Greece,
were present. The conference lasted two
days and during this time numerous important questions of a technical, scientific
and sporting nature were discussed.

The Commission plans to investigate the possibilities of sailflight in tropical countries. It hopes to enlist in this project the assistance of motor pilots who have been trained as sailfliers, and the meteorological stations of India, in which country the conditions seem especially favorable.

The body also passed resolutions to encourage cooperation between the designers of motor planes and sailplanes and made recommendations regarding traction starts of sailplanes. It created a uniform badge for sailfiliers and announced an annual sailflying contest.

THE DO. X II, which was delivered to Italy on August 28, 1931, has been christened "Umberto Maddalena." The machine flew in two hours thirty minutes from its

native Lake Constance across the Alps at an altitude of 10,500 feet to Genoa, where the Italian crew came on board. After only five test flights the new crew made a long and successful tour of Italy with the ship.

ON November 1 the winter schedule of the Luft Hansa went into force. The reduced summer prices are being maintained, although the service had to be curtailed considerably owing to further reductions of the subsidies. Luft Hansa ships will fly only 6,500 miles daily. On all the main international routes the service will be carried through as in the summer and eighteen German and ten foreign cities will be service. The line to Copenhagen and the service between Munich and Vienna had to be dropped for the winter months. A foreign line will, however, continue service from Hamburg and the Rhineland to Conenhagen.

THE Union of Professional German Filots will for the first time award in 1932 two prizes presented by Dr. Theodor Lewald, honorary president of the Union, and Dr. Hans Luther, the president of the Reichsank. The Lewald prize will be awarded to the pilot who has made the best transport performance of the year and the Luther prize for the best essay on definite important themes.

#### CHINA

THE Chinese fancy dictates numerous gadgets on its planes, as evidenced by the popularity of the new Moth planes which are being imported. Nineteen of the new models, which are replete with attractive accessories, were recently sold to Mukden.

THE Sino-American airline, operating five amphibion planes, is now carrying passengers and mail daily except Mondays between Shanghai and Hankow, stopping at intermediary ports. Other airlines operating are: Hankow, Shasaichang, Wanshien, Chungking, semi-weekly service; and Nanking, Peiping, daily except Monday. The Sino-German airline operating between Shanghai, Peiping via Nanking has abandoned the the extension through outer Mongolia to Manchuria and is now planning a new route through Suivant to Europe

#### CANADA

IN order to make the air mail routes of Canada more popular a number of changes have recently been made, the latest of which has brought the air mail postage down. The first ounce now costs six cents, and the second and subsequent ounces have been lowered from ten cents to five cents. This applies to domestic and United States destined air mail, and has been brought about by the continued representations of business men throughout the Dominion. The new rates went into effect immediately, being announced toward the end of October.

While some air mail routes have been suspended as an economy measure, many of the runs have been put on a faster schedule.

CONSIDERABLE interest is being shown in the proposed Canadian Guild of Air Pilots, an organization of pilots with at least 200 hours of flying to their credit, to protect professional interests from legislative enactments; establish minimum requirements of skill, including navigation for instructors; establish minimum rates of pay for pilots and navigators, and to establish an employment bureau for members of the aviation trade. The Guild will be affiliated with the Guild of Air Pilots and Navigators of the British Empire.

CELEBRATION of the fourth anniversary of the founding of the Toronto Flying Club took place on November 7 and 8. The Moore-Curtiss Trophy was won by Frank James, who carried the forced and dead stick landing divisions; Bruce Douglas won the spot-landing and the bombing con-

#### CIVIL AERONAUTICS IN AUSTRIA

CIVIL AERONAUTICS in Austria is supervised and regulated by the ministry of commerce and transport. The Austrian Aeronautic Commission, composed of experts in the different branches of aeronautics, cooperates with the transport ministry in an advisory capacity. The regulation of civil aeronautics is founded upon the country's basic air traffic law of December 10, 1919; this was supplemented in detail by the air traffic regulations of September 8, 1930.

A testing institute under the direction of the Technical University examines airplanes and equipment purchased abroad. If the airplanes are approved, they are licensed by the ministry of commerce. All crashes are investigated by the ministry. In practice, local Austrian air transport

is restricted to domestic companies, which are the only operators which may be subsidized by the government. The Austrian Air Traffic Company, known as the "Oelag" or Austrolig," is the only air transport operator subsidized by the government; this company was formed in 1923 and now operates the following three services: Vienna-Salzburg-Innsbruck, Vienna-Gratz-Lagenfurt, and Innsbruck-Salzburg-Klagenfurt.

Ten services are operated over Austrian territory jointly on a pool basis by "Oelag" and foreign companies. In addition, four services are operated exclusively by foreign companies.

In the agreement between the International Air Navigation Company ("Cidna") and the ministry of commerce, "Cidna" must employ a certain percentage of Austrian pilots.

The "Oclag" operates ten Junkers planes of the following types: one G 31, two G 24's, six F 13's and one A 20. The capital of the company is given as 400,000 shillings (\$56,280.) Pilots employed by the company are trained in most cases in Germany at the expense of the Austrian government. The personnel of the company consists of ten pilots, four flight engineers and four radio operators.

There are five commercial airports in Austria located at Vienna, Gratz, Klagen-furt, Salzburg and Innsbruck. The first three are owned and operated by the national government; the latter two by the municipality in which they are located and subsidized by the national government.

#### GREAT BRITAIN

OFFICIAL figures just disclosed show that the three hundred British service airplanes engaged in the air exercises of 1931 of the Royal Air Force flew a quarter of a million miles in forty-five hours. The "war," which took place during three days and nights in July, was staged to determine the state of London's defense against attack from the air.

Conclusions now advanced by the air Ministry indicate that, in spite of the city's vulnerable location, with a sufficient air force London can undoubtedly be defended from air attack.

IMPERIAL Airways has announced special discounts on its regular services to members of flying clubs in the United States. Credentials must be presented. The company has for some time allowed discounts to members of clubs in the British empire and has recently decided to extend these to the United States.

IN preparation for an attempt on the world's non-stop long distance record, Squadron Leader O. R. Gayford and Flight Lieutenant Bett on October 27-28 flew 2,857 miles from Cranwell, Lincolnshire, to Abu Sueir, Ezynt, in thirty-two hours.

They flew a Fairey long range monoplane powered with a Napier engine of the standard Series XI type. A "robot" automatic pilot was employed and was reported to be of valuable assistance in saving the pilots from the strain of long hours of piloting. Bad weather was encountered over much of the journey but the robot functioned perfectly under circumstances that would have placed the human pilot in serious difficulties.

Further tests were made in flying from Abu Sueir to Khartoum, and it was planned to fly back to Abu Sueir and from there back to Cranwell. FOUR day bombers of the Royal Air Force left Cairo no October 14 on a service cruise of more than 11,000 miles across equatorial Africa. Data will be gathered for possible future air service to link cities in West Africa. The fleet will be absent from its headquarters at Cairo until about the middle of December. Fairey planes powered with 530 horsepower Napier water-cooled motors are being used in the flight.

#### RUSSIA

A FACTORY to produce 1,500 motorless gliders a year, a chain of glider clubs throughout the country, and experimental institutes have been established in Russia as a result of Osaviakhim's campaign to popularize the gliding sport.

The factory, which is located near Moscow, will produce both primary and advanced types. Gliding schools have been established at Moscow, in the Crimea and Siberia and others are planned. In connection with the schools an experimental institute for glider design and a meteorological bureau for the study of air currents have been established.

#### SWITZERLAND

A NEW transport company, known as Swissair, has been formed with head-quarters at Zurich. The new company is a combination of the Balair and Ad Astra organizations and was brought about by the reduction of government subsidy. Capital of the new company will be about \$154,240.

#### ITALY

GENERAL ITALO BALBO has indignantly denied reports that he will lead twenty-four seaplanes across to New York. The reports were widely printed in the United States.

#### FRANCE

IN a secret corner of the Aviam Wey-

mann factory near Paris, two flying-boat type auotgiros are being completed for the French Navy, many of whose ranking officials believe that they will entirely replace the expensive dirigible airships now in ser-

The autogiro boats are expected to materially enhance the effectiveness of the French naval reconnaissance system, since they will more than double the top speed of the dirigibles, will operate in weather unsuitable for balloon use, and will be enabled to extend the functions of the conventional flying boat by their ability to alight in rough water.

THE Bernard Company has built a monoplane with a 480-horsepower Lorraine engine which has telescoping wings. The span can be increased from forty-two to sixtyeight feet. It is reported that the speed is increased from 155 to 185 miles per hour by decreasing the wing area.

THE Farman company is reported to have flight-tested a high-altitude airplane with a highly supercharged engine, having a seventeen-foot variable-pitch propeller, and a hermetically sealed supercharged cabin. It is expected to develop a very high cruising speed of about 300 miles per hour at an altitude of \$50,000 feet.

#### CZECHOSLOVAKIA

A NEW airport is being constructed at Budweis, Czechoslovakia, at a cost of \$56, 280. A contract for the building of the port was entered into between the Czechoslovak Ministy of Public Works and the municipality of Budweis. Of the total sum, \$29,600 will be devoted to the construction of hangars and other buildings.

THE installation of light towers in Czechoslovakia over the route flown by the "Cidna" Company has made possible night flying between Prague and Paris.



Acma Puoto

The R. A. F. Fairey (Napier-powered) ready for England to Egypt test flight preparatory to an attempt on the world's distance record



## PIERCE "SILVERWING" SAILPLANE

HE year 1928 marked the resumption of glider activity in America. We say resumption because prior to the advent of the successful power-driven airplane of the Wright Brothers the glider was used extensively by experimenters both here and abroad. These pioneers hoped to discover nature's secrets of flight by riding their strange crafts down hillsides against rising currents of air. Later, after the airplane had been demonstrated publicly, the glider again became popular but this time as a sporting proposition. This period extended from about 1908 to 1914. The War interrupted further developments but when it ended, Germany, under the restrictions of the Versailles Treaty, made rapid strides in glider development.

This bit of glider history is doubtless familiar to many of our readers but it is reviewed here because the designer of the "Silverwing" Sailplane is a veteran model and glider builder. In 1908 he built his first glider, which was of the so-called hang-type. Later this machine was exhibited in Madison Square Garden, New York City. By this time fame had already singled out this vouthful aeronautical enthusiast as the young man who raised the distance record for models from a short hop to 2,733 feet. More gliders were built during succeeding years and now we have his fifth for this month's study. This is distinctly an all-American project, having been designed, built, and flown by Mr. Percy Pierce,

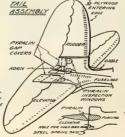
ALLERON ROCKER ARM ASSEMBL

R. E. DOWD

veteran model builder and flight manager of the Delaware County Glider Club. The construction took a full year of spare time and was largely done in the cellar of his home at 7,727 Parkview Road, Upper Darby, Pa. The cost of materials is estimated as approximately eight hundred dollars.

If we were to attempt to classify the "Silverwing" Sailplane, we would doubtless call it a high performance, cantilever wing, soaring plane of plywood construction, patterned after Germany's best designs, but possessing many original features. There seems to





have been an unwarranted aversion on the part of American glider designers to adopting foreign practices. This has resulted in some notable advances but it has evidently left us without really high performance craft such as are competing on the Wasserkuppe annually. However, here we have at last an all-American sailplane, from which we can expect big things. Already it has been successfully flighttested over Wings Field Airport, Blue Bell, Pa., with splendid results. It will shortly be thoroughly tested in the mountain regions.

Many of the construction details are shown in the drawings but in addition we are able to offer some further points through the kindness of Mr. Pierce.

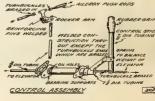
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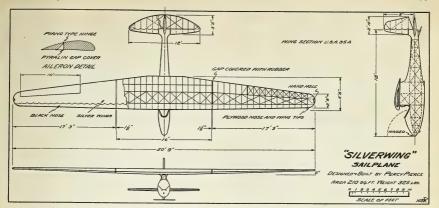
The design is technically known as a full cantilever, semi-monocoque, high wing type.

Fuselage

The two main bulkheads, which support the front and rear wing spars, are ¼-inch 5-ply birch. The other bulkheads are ¼-inch 3-ply birch. Four spruce longerons, ¾-inch square, tapering to ½-inch square comprise the main longitudinal members. A series of battens ¼-inch are used to preserve the form of the bulkheads between longerons. The covering is 1/16-inch 3-ply birch throughout, except for the sharp curves at the rear, where 1/32-inch 3-ply birch is used.

The main skid is spruce with a 1/16-





inch cold rolled steel runner to take ground wear. The skid is sprung on cushions of rubber. The front cowl is hinged at the nose and may be readily lifted up for inspection or adjustment of controls. It also facilitates entering and leaving the cockpit. For extended soaring over mountainous regions or on cross-country flights such an arrangement is of great importance. Parachutes are frequently worn but their value is open to question if an emergency exit can not be made quickly.

The rear end of the fuselage tapers down to a rigid vertical and horizontal portion used to anchor the control surfaces. The bottom portion mounts a spring steel tail skid.

Empennage

Except for the small root sections

just described at the rear of the fuselage, there are no fixed surfaces. Both rudder and elevator are balanced. The gaps at the hinge points are carefully covered with pyralin flaps, which prevent any turbulance in the air flow as the surfaces are operated. Pyralin inspection windows are provided for both rudder and elevator controls. Wino

The full cantilever wing is made in three sections. The airfoil is U.S.A. 35-A. Two main spars are used and the connections are made with chrome molybdenums fittings and bolts. The gaps at the connecting points are covered by sheet rubber stretched in place.

The ailerons are ten feet long and are hinged at the top surface of the

wing section. Pyralin gap covers close the gap so formed and the thickness of the section permits the control to be entirely housed inside.

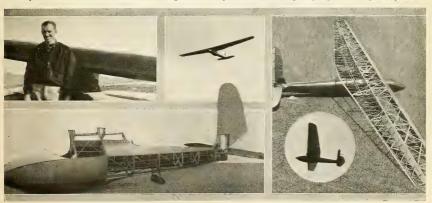
Controls

The elevator and aileron controls are rigid throughout, using push and pull tubes. Adjustments are provided for altering the lengths of the tubes so as to correct alignment. Suitable couplings are also provided at the point where the tip sections of the wing join the center section.

The rudder is operated through cables actuated by a rudder bar.

Performance

It has not as yet been possible to obtain accurate performance data. Tests over a flat airport indicate a gliding angle exceeding twenty to one.



Percy Pierce, veteran model and gilder builder, and his newest sailplane "Silverwing"

and eminent domain.

## ACTIVITIES OF THE AERONAUTICS BRANCH (Continued from page 27)

ning lights, airway beacons, and colors of aviation glasses. In addition to the foregoing, special research committees of the Aeronautics Branch, organized cooperatively with the industry, are working on problems pertaining to airport traffic control and airport drainage and surfacing. The reports of two other committees, whose work was concluded during the previous fiscal year, were published during the year. One of these committees engaged in a study of the control of hangar fires by the automatic application of water, and the other in a study of airport zoning

#### Passenger Airline Inspection

The Aeronautics Branch continued the development of its inspection procedure under the regulations governing the scheduled operation of interstate passenger air services, which were adopted last year. Every line now engaged in carrying passengers in interstate commerce on schedule is operating under a letter of authority which is tantamount to the certificate of authority provided for in the regulations.

The inspections conducted by a staff of specially qualified airline inspectors are producing results which may be

described as threefold:

1. They give the airline managements the benefit of outside expert advice and suggestions based on personal

experience of the inspectors with the lines in question.

2. They give the Department of Commerce evidence as to the qualifications of the airlines to carry passengers in scheduled interstate commerce for hire.

3. They serve to reassure the public that the Department of Commerce and the air-line operators are cooperating closely for the further advancement of safety and reliability in scheduled air passenger transportation.

The airline regulations have become necessary in order to standardize the various methods of scheduled interstate passenger air transport operation that have developed and will continue to develop in the future. They are in furtherance of a comprehensive, fundamental program which has been developed under the provisions of the air commerce act. Airways are now extensively established, satisfactory communications equipment is becoming available, and the required use of such facilities and aids to air navigation in the interest of increasingly safe and reliable operation in a uniform manner is definitely in order.

#### Scheduled Air Transport Progress

Progress of a most gratifying character has been made by scheduled air transport operations during the past fiscal year. Compared with June 30, 1930, the total mileage flown daily by air transport companies both in the United States and on foreign extensions at the end of this fiscal year showed an increase of 37,132. The present total mileage flown on schedule every 24 hours in the United States, and to Canada, the West Indies, and Lain America is 140,314. During the calendar year 1930, a total of 417,505 passengers were carried and nearly 37,000,000 miles were flown.

A general improvement in the miles flown per accident in scheduled operations is noted through the first half of the fiscal year. Reports for the last half are not yet available.

The bulk of the Nation's flying is carried on in miscel-

laneous operations such as student instruction, aerial sightseeing, exhibition flying, crop dusting, aerial photography, and kindred activities. More than 108,000,000 miles were flown and nearly 3,000,000 persons were carried in this type of activity in the calendar year 1930. Of this number, about 1.850,000 were carried for hire.

For the first half of the fiscal year more than 50,000 miles were flown in miscellaneous operations for each accident, and 353,141 miles for each fatal accident.

#### Manufacturing Activities

The manufacturing phase of the aeronautics industry has changed from a large number of producing units, many of them small local companies hastily formed to supply a demand for aircraft which seemed apparent a few years ago, to a specialized group surrounded by the highest type of engineering, producing, and marketing personnel obtainable to-day.

Although smaller in number, the manufacturers now producing are better equipped to operate at high capacity than ever before. The factories possess the latest equipment and are operating according to the most efficient production methods, and could doubtless increase their production by a large amount within the next year if the need arises.

Reports showing the amount and type of production of aircraft are compiled according to calendar years. During 1930, aircraft, engines, parts, and equipment were manufactured having a total value of \$61,211,198. Heavier-than-air aircraft, excluding power plants, were responsible for \$27,333,736 of this total, representing 3,437 airplanes. Lighter-than-air aircraft accounted for \$365,021. Airplane parts manufactured during the year were valued at over \$7,000,000. The total value of aircraft engines and parts was \$22,396,054. In 1929, 6,111 airplanes valued at \$66,638,299 were manufactured. The total value of airplanes, parts, and equipment (not including lighter-than-air aircraft) was approximately \$100,000,000 for 1929.

#### Licenses and Approvals

Another indication of the progress in civil aeronautics may be gleaned from the licenses and approvals issued by the Aeronautics Branch following examinations and inspections.

Airports and landing fields also increased in number. At the end of the fiscal year there were 1,870 such facilities, representing an increase of 215 over the number on record a year before. The present total includes municipal and commercial airports; Army airdromes, Navy and Coast Guard air stations; and Department of Commerce intermediate landing fields and marked auxiliary fields. There were 541 proposed airports of which the Aeronautics Branch had knowledge at the end of the year.

With the passing of each 12-month period, direct evidence continues to point to the permanent position occupied by aeronautics in our national economic life. Millions of people now are availing themselves of the advantages of air transportation, both scheduled and miscellaneous in character, and the value of this rapid and directroute service doubtless has manifested itself to all who have employed it in furtherance of their business and social lives.

Before the Federal Government came to the assistance of the science and industry in 1926, the future of civil and commercial aeronautics was regarded almost wholly from a theoretical viewpoint. In the few short years that have intervened aeronautics in the United States has established an enviable record. Its world leadership in the number of pilots and planes engaged in civilian pursuits, the number of scheduled air lines, miles flown, passengers carried, pounds of mail and express transported is undisputed. The constant development that is taking place throughout the United States and the further coordination of air transportation with the best features of surface transportation all are contributing to the advancement of our nation.

The Aeronautics Branch is proud to have a part in this pageant of historical events that is being unfolded daily and is mindful of its obligations under the air commerce act to promote and regulate civil and commercial aeronautics. To regulate is to take steps in the interest of safety. To increase the safety of air transportation is to advance and promote its use. The two are interchangeable and can not be separated without jeopardizing the future of aeronautics.

#### MEANS FOR INCREASING THE LIFT

(Continued from page 39)

the chord of the overhanging portions and at 33 percent of the portions to the rear of a fixed surface or the fuselage. The rudder surface is divided into strips parallel to the motion of the airplane, the rule applied to all strips and the effect summed up. The product of all strip areas multiplied with their lever arms from the hinge, added up and divided by the complete rudder surface, gives the lever arm for the entire rudder. According to Diehl, this lever arm should be between four and six inches.

Flaps are excellent for use as controlling means but they are not successfully used without additional devices for the increase of the lifting power at landings and take-offs, with the purpose of decreasing the minimum speed. The improvement is not large enough, and it is paid for too highly by the additional weight and complication and by the increase of the drag of the wing through the hinge gap. A larger wing without flap would have the same maximum lift without much larger drag. The maximum increase of the lift co-efficient obtainable by flaps is .60 to 0.70. That helps for the decrease of the minimum speed but not in any extensive way. Climb and ceiling are hardly improved by flaps because the accompanying drag increase is too large.

One device for increasing the maximum lift, which has received much publicity, is the slotted wing. The slot or slots extend parallel to the span, and the wing section is carefully shaped for obtaining the slot action. The slotted wing was invented by Lachmann and developed by Handley Page. Composite wing sections have a larger maximum lift coefficient than simple wings of the same area. The surface of the slotted wings is actually larger than the surface of the single wing of equal area, but this does not fully explain its effect. The effect of the air friction is distributed over a larger amount of air, the different surfaces coming into contact with different air, not with the same air, and therefore the disturbing effect of the friction is diminished and the burbling point raised. The maximum lift coefficient of the ordinary wing section is up to 1.5, and that of slotted wing sections reaches 2.0 and even 2.5. The improvement is quite noticeable but not large enough to bring about any essential improvement of the flight properties. The larger maximum lift coefficient anyhow is not realized in flight, but only in model tests. In model

(Continued on following page)



DETROIT

APRIL 2nd TO 10th INCLUSIVE

## THE PROVING GROUND OF PUBLIC ACCEPTANCE

The National Aircraft Show held at the Detroit City Airport and Hangar is acknowledged as the world's leading aircraft exhibition. It is the aircraft manufacturer's greatest opportunity to exhibit and demenstrate his products to a public that evinces a definitely increasing interest and purchasing power in the aircraft field.

The Detroit Airport Hangar—the largest in the world -offers 200,000 square feet of exhibition space. Facilities for handling spectators are unequaled anywhere else in the United States.

Indications are that the record attendance established during the 1931 show will be broken during the 1932 exhibition.

Applications for space should be made immediately for the 1932 show. 60 days prior to the opening of the 1931 show at Detroit every foot of hangar space was sold and it was necessary to provide 14,000 square feet of additional space immediately adjacent to the hangar to accommodate manufacturers.

For space applications and information address

#### AERONAUTICAL CHAMBER OF COMMERCE OF AMERICA, INC.

10 East 40th Street, New York City

For detailed information address

RAY COOPER 320 W. Lafavette Boulevard, Detroit, Michigan tests the slot can be made ideal without bridging; but with airplanes, this is not possible because the different units of the wing have to be fastened together, and a diminution of the maximum lift coefficient is the consequence. It may also be that the larger scale is less favorable to a high maximum lift.

The increase of the maximum lift is accompanied by an increase of the profile drag. This makes the rigid slotted wing impractical. The slots have to be closed when flying at high speed, and they have to be opened at low speed only, chiefly when landing and taking off. This can be done manually by the pilot, or automatically by utilizing pressure difference at several points of the wing.

Slots increase neither the lift at ordinary angles of attack nor the slope of the lift curve; they merely delay the
burbling. In consequence, excessive angles of attack are
required for the large lift coefficients and the application
of the slotted wing necessitates high landing gears in order
to get these angles on the ground. This higher landing gear
has a larger parasite drag, and is not practical. Slotted
wings therefore are not used by themselves, but in conjunction with flaps. By being turned down, flaps increase
the absolute angle of attack without necessitating a large
angle of attack of the entire airplane. The slot ensures the
full utilisation of the flap, preventing premature burbling.
In this way, lift coefficients up to 2.0 and more are reached
without necessitating excessive angles of attack of the airplane.

This slot, alone or in combination with the flap, can also be used for control purposes by making the slots on either side of the airplane independent of each other. Slotted wing sections are sensitive to adjacent shapes, and a good section for use with a slotted wing has to be developed as carefully in painstaking experimental work as with ordinary sections; in fact, the work is even more difficult because more variables are involved.

Other devices for increasing the lift and obtaining more compact lifting structures have been tried out sporadically in several laboratories but they have not as yet been employed in the air. They offer, however, a distinct promise of becoming useful when more information about them is available. Of these more recent devices, there is first the rotor: this is a wing consisting of a circular cylinder with the axis parallel to the span and rotating so that the top moves back. With the proper speed of rotation the lift coefficient (referred to the product of diameter by the span of the cylinder) may reach values as high as ten. Hence the diameter needs only to be one eighth of the equivalent wing chord, and a much more compact carrying structure is obtained. The center of pressure is practically always at the center of the cylinder, and the lift is independent of the angle of attack, depending on the speed

The drag of such a rotor is large, which makes its application in its present form impractical. It is quite possible that the drag can be reduced to a much lower value by streamlining or by the methods discussed below in this article. Rotors may some day become practical but this is doubtful in view of the complication of the arrangement. Rotors have been tested on surface ships to take the place of sails. They were a disappointment and did not give as much driving force as was expected. Many inventors specify rotors for their various purposes and expect much more from them than they can get, basing their belief on the high lift coefficients observed with rotors. It must be

and on the rate of rotation only.

remembered that a rotor, like any wing, is an air deflector. and a very effective one, at that. However effective it may be, however, the rotor (or a plurality of rotors) can never do more than deflect the air available. The largest air forces obtainable are therefore limited by the air available and by the reaction obtainable by deflecting all of it completely. It becomes apparent that the concentration of too much deflecting capacity becomes ineffective as soon as there is nothing left to be deflected. In consequence, an accumulation of too many rotors in a small space in general cannot develop the full lift computed from the lift coefficient of one insulated rotor. There is a large induced effect and also a large interference. Chiefly, rotors promise more compactness for the same deflecting capacity, but not so much an increase of the deflection effects within the same space.

Another possible way of improving the aerodynamic effects is the prevention of burbling by suction and pressure action. A small portion of the flowing air is specially guided under the action of blowers, removed from certain regions of the open flow and pressed into other regions. The only thing definitely known so far is that very large and surprising effects can be obtained in that way, but we do not yet know exactly what can be obtained, nor how. There is a vast field for promising research which is still unexplored. Such super-modern aerodynamic methods may not only increase the lift but they may also be practical for diminishing the drag. Nothing indicates that the arrangement has to be mechanically complicated nor expensive; it may be that very primitive combinations will serve the purpose.

Lift can also be created by rotating wings, helicopters and autogiros. They are not different from wings but are only wings in a special application.

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## AIRPLANE LAUNCHING CATAPULT (Continued from page 44)

greasing and inspection are necessary as a modern catapult performs all its operations automatically after one movement of the control lever. Except for the towing cable, very few parts of a catapult ever wear out, and if its capacity requirements are carefully anticipated, it is not

likely to become obsolete for several years.

From day to day we read of the development of autogiros and other aircraft which can descend almost vertically. The latest of these is the three-wing X-L-2 airplane designed by Edward H. Lanier of Covington, Kentucky, It has a central wing, located directly over the fuselage, which increases its stability and acts like a parachute, thus permitting very slow landing speeds. It rolls only about twenty-five feet after the wheels, without brakes, touch the ground. So it appears that vertical descent and landing on small areas is nearing a solution and, with the commercial employment of the catapult, airplanes may take off with equal safety and celerity.

There are approximately 2,000 airports and 12,000 airplanes in the United States, and the number is rapidly increasing. If each of these airports had a catapult, the possibilities in this line of equipment can be readily realized. It would probably pay fields which specialize in short flights to have a catapult for public attraction. DECEMBER, 1931

When we consider that some of the larger airports, such as the new Hog Island Airport being developed in Philadelphia, are over 1,000 acres in area, and will cost several million dollars, it is time to "stop, look and listen" to the signs of the times. These large airports are located miles distant from business activities and they are unnecessarily large and expensive. Many of them will probably be obsolete before they are completed. The new Tom Thumb airport located in a central city park or on a rail-road station roof will capture the public patronage.

## THE BLIND SPOT (Continued from page 29)

favor of aircraft. A second transportation adjustment is equally in favor of travel by air. They call it, I think, "decentralization of populations," and it is suspected to be taking our cities apart and putting them together again in new places. A dozen causes are doing it. Sometimes a tax-burdened industry moves out of town to find cheap land, clean air and cheerful labor. I saw a big new factory lately, hidden high in the hills of Pennsylvania, where once they produced nothing but pulp lumber and Pennsylvania Dutchmen. Sometimes the shift can be blamed on the suburbanite, who may live thirty miles from his work today and think little of it. Sometimes it is climate that creates new communities where there were none before, or else it is the presence of fuel or power or raw materials. But whatever the reason, this seems to be moving day for industry, for the business that follows it, and for those who depend upon it for their livelihood.

The result is that we are discarding all our old ideas of distance and substituting the idea of accessibility by means of modern transportation. I went a week ago on a day's journey upstate and back. I could chisel only one working day for the trip, or my job might have got away while I wasn't there to watch it. I went more than 600 miles in 30 hours, and had time to spare for business and pleasure. I might have made better time if an airplane had been going my way, but there waan't one. But the point of the episode is that I couldn't possibly have made the trip at all without the aid of express transportation.

We don't need to decide whether speed is scattering our civilization or the scattering has created the necessity for speed. A man at a good breakfast of ham and hen-fruit doesn't need to answer whether the egg or the hen came first. But the two facts of fast transportation and the deentralization of civilization are rearranging the world around us. It goes on imperceptibly to most of us, but it goes on surely and rather swiftly. And in the scheme of the rearrangement the airplane will play an important part.

I suppose that little can be done to plan the progress of aviation to fit the facts that lie behind the blind spot. Aviation, no doubt, must muddle itself out of the present mess and through thirty-nine others before it entirely fulfils its transportation function. The business casualties on the way will be plentiful and pathetic. Air services with excellent prospects will go broke; others that have no business to succeed will strike a rich vein of public patronage. Big enterprises will fall to pieces; little ones will grow to giants. If we could see clearly past the blind spot we might avoid this wasted effort and extravagance.

But the blind spot is put there, perhaps, for some good (Continued on following page)

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(Continued from preceding page)

reason, possibly in order that we may not live too lazily or become too cock-eyed confident that we know what it's all about. All that we can be sure of is that the trend of transportation today is toward more speed and greater mobility, and that the airplane is a fast and adaptable piece of machinery. Beyond the blind spot we can see, as through a glass darkly, the shadowy outlines of a cilivization spread over all the earth, needing and demanding the utmost in speedy communications. And in this future, which may be much nearer at hand than we think, aircraft will have plenty to do.

#### SPEED IN AIR TRANSPORT

(Continued from page 28)

light enough they are usually very susceptible to damage. If they are strong enough they add appreciable weight. They cost money in time and maintenance in fitting and removing. During the war, lots of beautiful streamline fittings were attached to various aircraft to improve performance. After a few days in the squadron they were invariably left off as not worth their trouble and weight. Pants on wheels come in that category. They are heavy, expensive, increase maintenance troubles, collect heavy mud and, in point of fact, while suitable for racing and special jobs, they are impractical for routine flying.

The retracting landing gear is apparently the latest gift from heaven to the speed merchants. First, does the landing gear really retract or is its resistance merely put somewhere else? Second, is it worth it? Most retractable landing gears, so far, have been pulled up into thick wings. Yet the thick wing, in spite of present day popular notions, is unsuited to the speed machine. If one examines pictures of the frontal areas of the fast planes of today (that is, those with the really high speed range) one will discover that there is practically nowhere to put the wheels. In other words, wheels retracted for speed can be used only on planes which are least efficient from a speed standpoint. It may be that in some multi-engined planes the engine nacelle-will provide a vacant space for the wheels, if there are means to get the wheels there.

In any case, however, does it pay? In the first place, the landing gear able to move about must be a heavy one. In addition, there is the weight of the operating gear and fittings. Then there is the cost of fitting these and of maintaining them. On the other hand, careful study enables a fixed landing gear to be designed of small total resistance, with the further advantage that, being lighter, it needs less wing area and wing resistance to support it. When one takes the cost of a retracting gear over a year's run, initial cost, maintenance cost and payload reduction, its advantage over a well-designed fixed landing gear is doubtful. Again the risk of crashes through retractable landing gears which the pilot forgets or is unable to lower, must affect insurance rates, still further raising the cost of the retracting gear.

The best that can be said for the cleaning up business is that, as very high speeds are designed for, elaborate streamlining becomes more important, but then its weight and cost are merely a part of the weight and cost which must be paid anyway for high speed design. That is quite a different thing from imagining that high speed can be obtained for nothing merely by cleaning up.

DECEMBER, 1931

It is true that some planes are so hurriedly and carelessly designed that appreciable speeds can be added in this way. Similarly many commercial planes adapted from military planes have several factors of inefficiency imposed by military requirements. There is no mystery about these things and they do not apply to properly designed commercial aircraft.

Again, higher speeds may be obtained by increasing wing loading and consequently landing speed. How much landing speed may be increased is a matter for argument. But when an operator decides that the X plane is faster than the Y plane, and is therefore a more useful type, he should first discover what the Y plane would do if it had the same landing speed as the X type. Most certainly, this is not generally done. Many types of planes have reputations for high speeds which in fact they obtain mainly by high landing speeds with consequent sacrifice of safety.

The real solution of the cleaning up problem lies in the study of interference drag which has been comparatively neglected until recently. This is a problem to be studied in the original design and not by tinkering with the plane. In the past where interference drag has been relatively unconsidered the biplane designer has suffered in having two sets of wings with which interference might be set up. This probably explains why monoplanes have often shown certain superiorities in performance which theoretically they should not have.

There is a growing impression in many circles that the conventional type of airplane today has little hope of becoming a commercial proposition and that some radical departure from present design will be necessary. There is not a particle of sound evidence to this effect. The science of aerodynamics has reached a point where we have at least a good idea of what service we are to expect from the horsepower that we put into an airplane. It shows us that the carefully studied and designed airplane of today will give us mostly what we can expect (apart from structural improvements) and that probably our best and cheapest outlook for improvement and refinement is in the study of interference drag.

From the practical point of view, I do not share the excessive admiration which seems to be given to those designers whose beautiful and "clean" designs have given a certain obvious increase in speed which has diverted attention from the increase in cost and decrease in load, comfort and safety. But their work has certainly been valuable in calling attention to the faults of the other kind of designer whose practical requirements make the machine so "ditry" that in many cases he seems to have given up all hope of making a "clean" job. External tanks for quick servicing, external control wires for easy maintenance, crude motor units and wing-bracing for simplified construction have too often, in the past, led to a carelessness in detail design which has inevitably led to a neglect of interference drag.

Another argument advanced by those who demand high flying speeds is the fact that a headwind is of increasing importance when the machine is slower. Thus most serious operational calculations for long distance include a headwind factor. This, however, brings us back to the blind flying subject. Effective use of the variations of wind with height can reduce the headwind factor to something almost negligible. Under certain circumstances a positive (Continued on following page)



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gain can be accomplished. It is not possible, however, to use this wind variation so long as our operational systems compel us mainly to remain in sight of the ground in order

to fly and navigate properly. As I have said, to find out what speed really costs there is no use trying to compare planes which have no points of comparison. Obviously if you crowd your passengers into a tiny space and use a high wing loading you will get a faster plane. If, however, you fix wing loading, space per passenger and the amount of cleaning up that can be done, you will find that it takes approximately twice as much horsepower to do 150 miles per hour as it does to do 120 miles per hour. Motor power and weight increase 100%, fuel load and consumption increase 60% and the time saved is only 25% of the flying time and a still smaller percentage of the total time. The weight of the additional power and the fuel necessary must then come out of the payload. I leave it to those interested to figure out just what this costs. On a fair calculation of that sort they will find that the extra thirty miles per hour cost an amazingly large amount. Of course, if you must run your airplanes in such a manner that they are limited mainly to daylight and fine weather, then all sorts of high speeds may be necessary to crowd your trips into the hours available. As air transportation progresses we shall undoubtedly have higher and higher speeds and the public will undoubtedly pay for them. But the problem today is not to get higher speeds out of our planes but to make better use of the speeds we have.

#### ZEPPELOONATICS AT LARGE

(Continued from page 31)

and thermos coffee I had consumed, yes. But real food, served by a waiter, no. It would have taken more than a mere Admiral to have removed me from that chair until I had finished breakfast. Whether or not the Admiral got fed eventually, I never learned. Certainly he missed those eggs and bacon, and also another plate of the same, which I induced the attendant to bring me, merely by fixing him with a stern eye and speaking as much like a retired Admiral as I could manage.

Well, as an old airplane pilot I have looked with some contempt on the big airships, lumbering along at sixty or eighty miles an hour, despite the fact that they can lumber along day after day and even week after week, without stopping to refuel. But that breakfast hit me a jolt, mentally. It was magnificent; it was stupendous; it was the smoothest and most nourishing transportation yet devised by the ingenuity of man.

I left the mess and began an exploration of the ship, inside of which are long runways known as catwalks, evidently for the reason that no creature less sure-footed than a cat would feel at home on them without considerable practice.

Now, about me there is nothing of the cat. My movements, by no stretch of the imagination, could be called feline. On the contrary, I more nearly resemble in my progression the blundering along of an angry rhinoceros through reeds. Therefore for me to imitate the surefootedness of the cat on those catwalks was a task of some difficulty. The walk itself was about eight inches wide, and of railing or guard there was no sign, other than a rope stretched here and there between duralumin girders. Even this was not continuous, for where the girders were numerous a rope was evidently considered superfluous,

and the cat-like stroller was supposed to cling to the girders alone. I may say that where I clung the marks of my clutching fingers in the metal doubtless will endure as long as the *Akron* does.

I should add here that if the Akron were a commercial passenger ship there doubtless would be covered companionways for passengers, but naval necessity demands the maximum of lightness, which in this respect is achieved most entertainingly by having such hapless wights as magazine writers imitate the spider skipping gaily from web to weh.

I endured some little nervousness until I noticed how much worse weather some of the other newshawks were making of it. I did make about half a mile an hour or so, but one leaden-footed writer simply grew to a girder and had to be forcibly detached when the ship docked. In fact, I heard that he wouldn't let go, even then, and that the crew had to cut out a section of that girder and let him walk out with it.

We Zeppeloonatics skipped hither and thither along the catwalks and up and down the aluminum ladders in the interior of that airship, much after the manner of overgrown ants in a gargantuan ant hill. Why none of us amateur acrobats fell off is doubtless explained by the nail and teeth marks on various girders. One of the lads, who had failed to heed the "four out of five have it" ads and therefore has machine-made uppers and lowers, slipped and fell to a girder below. And would you believe it?—his upper and lower plates were found clamped tight to the girder from which he had dropped. He had simply slipped out of his teeth! He climbed back up, but couldn't persuade the grinders to let go. He made the rest of the flight clamping girders with his gums.

Despite these hardships, the devoted men of the press crawled all over that Zeppelin. To stand on a catwalk and watch several of them crabbing along was one of the most pathetic sights it has ever been my sorrow to witness. I believed the crew enjoyed it and regarded our performance as some slight recompense for the damage we were inflicting on the unfortunate mess funds. For no matter where we wandered, or to what heights we climbed, none of us fell out of the ship, and none failed to fall into the mess rooms for breakfast and dinner. Whether it was the air, the smooth motion, or the depression I don't know, but the fact is that we cleaned that larder out so completely that when we finally landed two mice also walked off, looking for something to eat. For lunch we had delicious roast pork, at which a Jewish correspondent blinked a moment, then fell on with knife and fork. "What excellent salmon," he said. The crew didn't get a break even from the children of Israel.

Everyone has seen photographs of the Akron, yet none of them give the slightest idea of the gigantic proportions of the Navy's new air cruiser. To comprehend its size you have to see it, and then you have to get inside of it and wander around for a while.

We had 107 aboard—yet the airship seemed deserted! True, the three mess rooms were filled at meal times; many were sleeping in the cabins, there were many in the forward control room, and a few in the rear, or emergency, control room, but outside of those inhabited sections, the ship was as lonely as a miniature golf course. Stand on the catwalk amidships, and away up forward you'd see one of the crew moving away somewhere; look aft, and you (Continued on following page)

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(Continued from preceding page)

might see another tiny figure. I stood at one time for several minutes and didn't see a soul. I might have been alone on the ship. However, the watch on duty were always busy; if they weren't in sight from where you stood, they were about somewhere, hidden by the twelve enormous gas cells. They were patrolling the avenues throughout the ship, along its sides, across at several points, up in the top corridor, pausing here and there to examine gasoline or water ballast pipes, to examine the gas cells or calling to the bridge by telephone—perhaps to report that a Zeppeloonatic was making heavy weather of it along the starboard catwalk, and will they send the stretcher bearers, as he's very shaky.

We had left Lakehurst at 7, headed south, and at 9:30 were over the Capitol. The Los Angeles had joined the Akron just before we reached Washington, and followed us as we circled over the city. Washington is the largest city in the world devoted exclusively to the pleasant business of spending money; it produces nothing and consumes everything—a sort of bigger and better N.A.A.

At Baltimore we flew over the Constitution—not the one they've amended so many times, but the other one that hasn't been damaged very much. She was at anchor in Chesapeake Bay, and the Akron dipped in salute to "Old Ironsides" before proceeding up the Delaware to Wilmington and Philadelphia. The Navy Yard there now seems to be used mainly for dead storage of submarines and destroyers. They had dozens and dozens of them tied together in the inner basins, and a battleship in drydock. Quite a good idea, I thought, to keep it there through the next war; then we'll be sure of at least one battleship to place in the Smithsonian after the war.

Nearing New York several of us were invited to visit the forward control car, where you get the finest view of any place in the ship. Little flocks of Zeppeloonatics had been taken there at intervals during the flight by Lieut. Morgan Redfield, communications officer, who had divided his time between the radio station and the care of the simple scriveners, who, if left to themselves, probably would have hacked off parts of the ship as souvenirs or thrown banana skins into the machinery.

Commander Rosendahl and Lieut. Commander H. V. Wiley, executive and navigating officer, stood on the bridge, as the front of the forward control room is called. They were doing no labor whatever—simply standing there. There were two helmsmen, one for the rudders and the

other for the elevators, and these two lads were working pretty lively, especially the one on the elevators. They were turning the control wheels back and forth at a great rate, for the day was bumpy and the big ship was plowing through the air currents and sticking her nose up or down as she moved into ascending or descending columns of air. The officers didn't do any manual labor. They weren't pilots-they were the commanders of a great ship of the air. They'd no more think of turning those wheels than the captain of the Leviathan would think of horsing the ship around himself. I can see where the social status of airplane pilots will improve as the airplanes grow larger. The farther away from all manual labor you move yourself. the better your standing. And if you get to a point where you don't even have to think for a living, then you're in society.

Just behind the bridge, in the next compartment of the control car, the navigating officer examined his maps and watched a compass. Farther back was the radio room and staterooms for the officers.

In addition to Seabury investigating New York, we investigated it from the air. We couldn't see any of the little tin boxes in which our city officials secrete the winnings, but we saw everything else, including a large proportion of the deep thinkers who so magnificently approved of Tammany Hall at the recent election. They looked about the way you'd expect them to look—all with their mouths open, and staring vacantly after the approved New York manner. Last week they had stared at Shipwreck Kelly standing on a flagpole; this week it was the Akron; next week it would be a steam shovel.

As we proceeded up the Hudson I made my way to the emergency control room in the forward lower end of the fin. By this time I had grown accustomed to the narrow catwalks and went hurrying down them with much of the agility of an able seaman. On my next flight I hope to wear roller skates and really make time. However, the climb down to the fin took some of the exuberance out of me. It is forty feet right down from the catwalk, and anyone who slips is guaranteed a practically uninterrupted descent to the sidewalks of New York, or whatever happens to be below. Here, on the metal ladders, I slowed down to a crawl, and wished that I had been favored with a somewhat larger heritage of the characteristics of my arboreal ancestors.

As we sailed over Manhattan I made my way up out of the fin and went on back and up into the tail above the



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lateral fin or stabilizers where there is a gun platform. Here I peered out as we sailed over the sea down the coast, returning to my landing station in the rear control car as we approached Lakehurst. From this vantage point I had a perfect view of the landing operations, saw the mooring mast out in the center of the field, and watched the ease and skill with which the Akron's officers and crew brought their ship down. Some of the propellers were turned to horizontal positions and blew the ship down, while others pushed her steadily and slowly forward toward the mast, the ship guided by her elevators and rudders, until the landing lines dropped, were carried by the men on the ground to the mooring mast, and made fast to the winch, which began to wind the nose down. Once the nose reached the mast, water lines were sent aboard, and, as we had landed "light," water ballast was pumped into the ship until the tail also descended and the immense craft rested her rear control car on a handling car that ran on a circular track around the mooring mast.

Our very delightful flight of nearly eleven hours was over. It was, without exception, the smoothest, most enjoyable, most interesting flight I have ever experienced. For comfort, pleasure, and interest no airplane flight can compare with it. Compared to an airplane's, of course, the speed was slow. But the Zeppelin type of aircraft is not intended for air transport over land, where it could not compete with existing forms of land and air transport. It is intended primarily for travel over the oceans, where it will be three times as fast as existing surface transportation. There the Zeppelin eventually will come into its own. May the day be near, so that those courageous spirits who have devoted their energies to its development may win some reward for their faith and their works, held to and carried on in the face of innumerable discouragements, disappointments, and general unbelief.

Returning to New York I read in the New York Evening Post a reprint from their issue of November 2, 1831—a hundred years ago: "The ship Colossus, Capt. Coffin, from Liverpool, brings Liverpool papers of the 22nd of September, and London papers of the 21st."

Only a hundred years ago. And the fastest ocean transport of those days consumed forty-two days on a voyage from Liverpool to New York! The Akron, from which I had just disembarked, could make the same trip in less than two days—in fact, could make three round trips without refueling! Who is rash enough to predict what the next hundred years will bring? We may yet see the day when all postmasters are Democrats.



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NEW BOSCH booster magnetos, complete, \$7.95. Special aircraft radio, slightly used, \$55. Two Wiley flares \$89. Six parachutes: Swittliks, Irvings, Russells, 24 "Seats"; bargains. Carl O. Congdon, Jr., \$240 West \$3rd \$tx. Chicago, Ill.

MONOFOUR, 4 place cabin monoplane, good condition, instruments, Bendix wheels and brakes, J-5 motor mount. \$275 less motor. Royal Motor Service, 3127 Western Ave., Peoria, Ill.

TRAVEL AIR, WACO PARTS, covers for all makes. Wings, uncovered; Travel Air lower, \$120. Waco, \$120. Travel Air upper, \$140. Waco, \$120. Roger Mensing, 1218 Jones St., Fort Wayne, Indiana. We repair airplanes and parts.

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TRANSPORT PILOT, one year Army flying cadet school. 300 hours, single, age 26, 4 years college, reserve officer, 3 years business experience. AERO DIGEST, Box 1242.

YOUNG MAN, 19, trained in airplane and engine mechanics, also welding, wishes starting position in industry. Vincent Alekna, 627 W. 18th St., Chicago, Illinois.

NAVIGATOR, MASTER MARINER, radio operator, Lieutenant U. S. Naval Reserve. Twelve years' practical experience. Would like to make long distance flight. Will go anywhere. AERO DIGEST, BOX 1243.

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YOUNG MAN, 21, private pilot, desires aviation connection. High school education, will go anywhere. George Wells, 11825 Detroit Avenue, No. 13, Lakewood, Ohio.

COLLEGE GRADUATE, Aviation Institute U.S.A., age 20. Desire connection giving start in aviation. Excellent references and record. Frank L. Oglesby, Glade Spring, Virginia. LICENSED First Grade Radio Operator, holding transport pilot's license, graduate Hancock Foundation; military flying training. Single, will go anywhere. Excellent references. C. Stellmach, 119 E. Morrison Ave., Santa Maria, Calif.

TRANSPORT PILOT, 485 hours, 1A rating, 3 years' experience instructing students, barnstorming and cross country. Age, 25, single, will go anywhere. Best references for character and flying ability; wages secondary. Howard W. Taber, 1291 Ashland Avenue, Bestrice, Nebraska.

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WRITE for Free Papers, or send sketch or model and description of your invention and I will send you information showing how to proceed to obtain a patent. No charge for this advice. M. H. Ford, Registered Patent Attorney, 225 Broadway, New York City.

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CURTISS-WRIGHT JUNIOR, 96 hours. Privately owned. Well cared for. Good condition. No crashes. Robert B. Taft, M.D., 105 Rutledge Ave., Charleston, S. C.

CURTISS-WRIGHT JUNIOR Demonstrator, same as new. Always hangared. Time three hours. Cost \$1895. Sell \$1075. Norton Flying Service, Norton, Kansas.

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MODEL A Wright Hisso's, government overhauled and block tested, \$150 each. Motors with from 75-100 hours, \$75. Supply limited, so hurry. Wallace Aero-Marine Service, Russell's Point, SACRIFICE SALE: J-5 Straight Wing Whirlwind Waco, licensed and in perfect condition. Ship is well streamlined and plenty fast. Price to sell quick, \$1750. Write or wire Becker-Forner Flying Service, Inc., Jackson, Michigan.

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OXX-8 TRAVEL AIR, model 2000, 155 hours. Purchased new June, 1930. Standard equipment and compass. \$1200 cash. W. S. Lephew, Logan Field, Baltimore, Maryland.

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NEW 1932 SHIPS. flyawap \$495; new production motors, complete with propeller and radiator, only \$195; quality propellers \$4.99 up. New Super Heath Parasol with new spare motor, worth \$1250, only \$496; photo and all information including leather bound flying manual, 25c stamps. Hibbs, Fert Worth, Texas.

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FOR SALE: Cessna 300 Wright, 110 hours. Ship just recovered. Also set Edo 3,830 floats. Chatham Hunter, 177 S. Front St., Memphis, Tenn.

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## Plane-Speaker Corporation

Manufacturers of the "Voice of the Sky" Equipment

#### An Announcement and a Warning

THE PLANE SPEAKER CORPORATION calls attention to the fact that it owns several United States Patents relating to the art of communication or broadcasting sound from aircraft while in flight, together with patent applications pending covering inventions which contain allowed claims for these devices. The United States patent which it owns are as follows: 1,531,586; 1,628,230; 1,667,287 and 1,667,300. It likewise owns patents in five foreign countries.

THE PLANE SPEAKER CORPORATION is the pioneer in the field of broadcasting sound from aircraft. It has spent large sums of money over a period of years in developing and perfecting devices for such use. Accordingly, it proposes to enforce vigorously its rights under these issued patents, and under the patents which will issue on the applications which are now pending.

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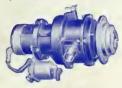
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